THE FOUNDRY

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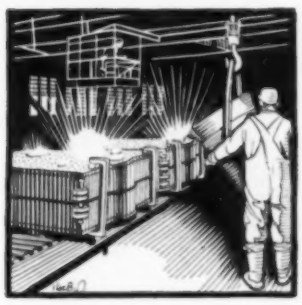

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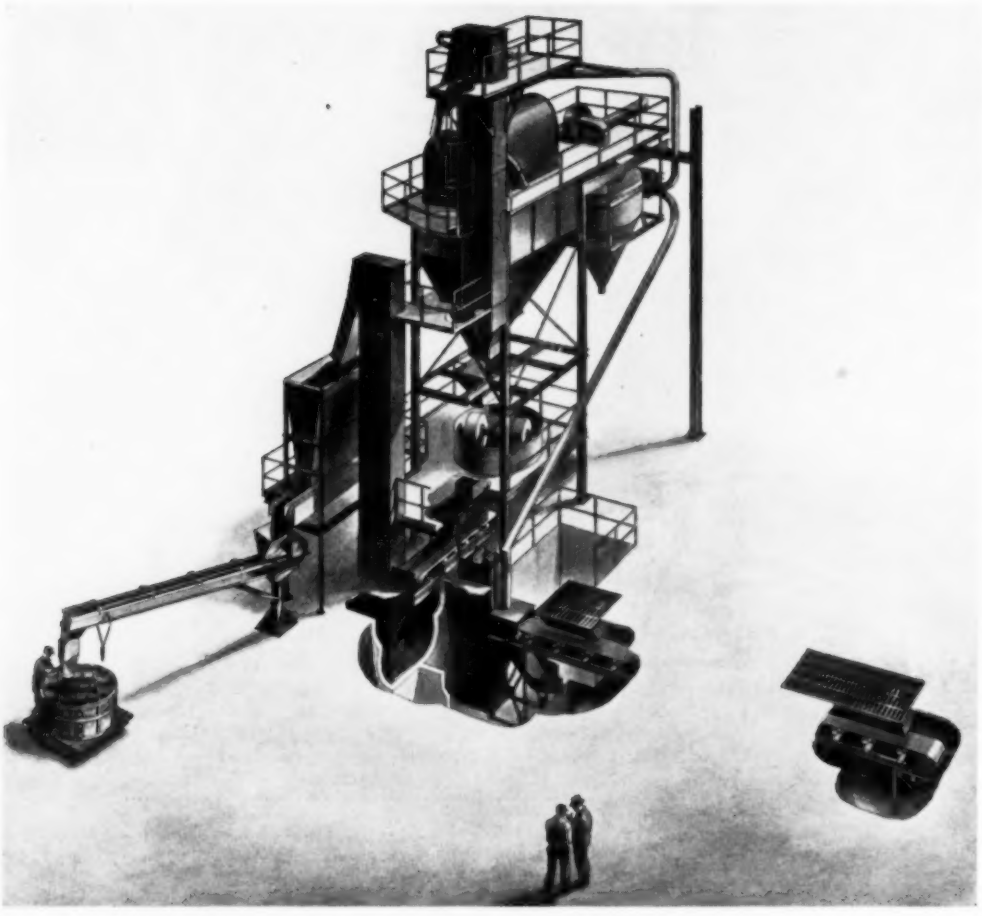

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THE FOUNDRY for June

Bankers Are On THE SPOT

COMPLAINT against banks is common in some quarters. This may be a convenient geyser for pent up feelings. Citing individual instances of timidity which led to a flood of bank closures and liquidations during the deflation, is no evidence of a general class trait. At present the dissatisfaction expressed by manufacturers and commercial interests is based upon another cause. The charge is made, that banks are not willing to extend credit to tide over worthy and solvent establishments. Further, maintenance of large cash reserves in banks, coupled with declining totals of business loans is submitted as evidence that governmental aid has been self applied, but not shared by banks. Financing going foundry firms in the purchase of needed new and replacement equipment is a local banking problem and civic responsibility. Foundries are valuable manufacturing enterprises in their various communities. They should not be driven to brokers' hawk shops or Shylocks to obtain loans for plant or machinery.

New Chances FOR PROFIT

VIRGINIA foundryman writes offering to take over the manufacture and marketing of standard commodities which have been made by firms now facing temporary shutdown or discontinuance. This hints at an asset item, possessed not only among plants entering the idle list, but in the hands of going firms. Freight rates, barriers and limiting boundaries of market areas, might demand an interchange of manufacturing rights between foundries. A large manufacturer of a heating unit contemplates marketing through foundries in different localities, supplying motivating parts and permitting the foundries to supply castings. Many having new innovations, useful and saleable, are unable to finance or to establish a central manufacturing plant, seek both factory and sales service in different localities. THE FOUNDRY gladly has helped bring together inquirers and sources for their casting needs. Anyone have a standard commodity for foundry production and sale in Virginia?

Is Business HOARDING

ALL that is hoarded is not gold. Hiding out cash, crippling credit and shaking confidence has been castigated—effectively. Other types of business hoarding, equally debilitating, flourish. The manufacturing plant that intentionally distorts facts to report a reduced rate of operation, the buyer who dangles a delayed order in front of hungry salesmen, the banker who impounds a depositor's balance against a secured debt not due and one who refuses credit on a going concern, are business hoarders of the worst stripe. Lest the charge of banker-phobia be entertained, the types are mentioned in their order of infamous influence. All are active factors in retarding and postponing reconstruction. Alike, they are influenced by timidity, fear, panic, and jittering lack of confidence. They are joined in common influence, if not in common cause and their kind is prevalent and increasing.

What's New IN JUNE

EFFICIENT practice in steel casting in this country is not due to immense demand. Progressive, aggressive action and free interchange of information have been responsible, says F. A. Melmoth, British born, American adopted, competent expert (Page 16). Battles are won, according to a reported observation of nameless Confederate by he who "gets there fustest with the mostest men." General Electric observes the principle in production battle, with speed and power applied in the shakeout (Page 19). Molybdenum is easier used than pronounced, but even use requires knowledge born of experience such as is supplied by J. KentSmith and E. R. Young (Page 20). A place for everything and everything in place adds to availability of scrap metal, says E. H. Trick (Page 28). New ideas, uses, processes and prospects spur faith in foundry accomplishment (Page 35).

Steel Founding in America

Size and Growth of industry results from aggressive attitude and exchange of ideas

By F. A. MELMOTH

GROWTH and development of the steel industry in the United States has been unparalleled in any country. It would be expected that in a comparatively new country, stocked with virile, enthusiastic pioneers, free from and unhampered by traditions, any expanding industry would be characterized by a robustness of outlook, somewhat difficult to attain and maintain in older countries more nearly approaching their peaks of development.

Fig. 1—Work of molding machine is co-ordinated with equipment to handle flasks, sand and other materials

The steel casting portion of American industry is no exception, as confirmed by the fact that production of steel castings in 1900 was 192,803 tons, a figure which had grown in 1929 to 1,583,040 tons. Only a successful industry could show such expansion, and no indication exists of any lag in speed on return to normal times.

The question naturally arises in the mind of the student of American steel foundry conditions: "What are the real causes and controlling conditions resulting in such growth?"

The author received his early education and technical training in Europe. He has lived in the United States during the last few years, and actively engaged in its steel founding industry. Therefore, his remarks cannot be interpreted as the result of over-stimulated national pride. His opinions must come as a result of conviction arising out of personal observation.

It is not uncommon in European business and in technical circles, to place basic responsibility for American rapid progress on the immensity of demand, and to conclude that with smaller schemes of production, success in such production must be necessarily more limited. Intimate contact with the industry of this country for a reasonable period demonstrates the fallacy of that conclusion. Were the product unsatisfactory, no more general business development could save it from being replaced in these days of technical and scientific ingenuity, and such growth as previously shown would be an impossibility.

The author's opinion, based on his own obser-

Fig. 2—Almost all steel castings made in the United States are subjected to some form of heat treatment

vations, is that the size and growth of the American steel founding industry is due to two factors: first, a progressive and agressive attitude on the part of steel founders, calculated to discover a continuously enlarging field of application for their product, coupled with an effort to make a steel casting the most obvious article for the purpose desired; and second, the free and open interchange of ideas and opinions which exists between firms, individuals and organizations.

Foundrymen Like Their Jobs

These two factors result in an enthusiasm for their job which is characteristic of the American steel founders, and which is prominently evident to any newcomer to the country. Such progressive thought and enthusiasm are surely the greatest single causes of success in any industry.

All recognized methods of steel production are in operation in the United States for the manufacture of steel castings. In 1929 the total number of tons of castings produced by process was as follows:

	Tons
Basic Open Hearth	588,213
Acid Open Hearth	544,076
Bessemer	30,829
Crucible	883
Electric	419,039

A study of the production figures to the year 1900 shows the following tendencies. All classes of open hearth castings have increased steadily, and account between them for two-thirds of the total steel casting production of the country.

Fig. 3—American inclination toward standardization is prominent in the preparation of sand for steel castings

Fig. 4—Engineering ingenuity has been adapted to a remarkable degree to the open-hearth furnaces employed in this country

Since 1918 there has occurred an almost coincident fall in the production of converter-made steel castings, and in 1929 that method only accounted for one fiftieth of the production.

Accompanying that reduction, and possibly accounting to some extent for it, a rapid increase has occurred in the amount of electric steel castings produced. That material began to assume real proportions in 1918, and from then to 1929 multiplied in quantity by four times. In the latter year, electric castings amounted to over one-quarter of the whole production of steel castings.

Production Is Divided

Production of crucible steel castings represents only an almost negligible proportion, being 883 tons in the year 1929, having fallen to that figure from a maximum reported of 17,571 tons in 1913.

As in all other steel making countries, the open hearth process in its variants of acid and basic, constitutes the backbone of all large production of steel. Steel founders in this country have realized advantages of heavy charges and consequent economic production, and the control of method offered by the process also makes it ideal for general forms of castings. The process also has been assisted in maintaining its popularity by the existence of large quantities of cheap fuel; both oil and natural gas are available in many localities.

Metallurgically, the processes are operated almost identically with European and other practice, and the steel made for castings is of consistently high quality.

From the standpoint of consistency of produc-

tion, examples of monthly averages of analysis shown in Table I, represent one foundry and the figures easily can be duplicated in many foundries. Figures of physical properties are given and variations from the average are exceedingly small. It is emphasized that the three hundred and three charges represent the whole of the production made under test, in the period considered, and no weeding-out of any indifferent results has been permitted. A close similarity in the data will be observed.

Exercise Close Control

The most striking point to a newcomer, on examining modern American open hearth furnaces, is the degree to which engineering ingenuity has been adapted to them. Controlled forced draft, temperature control in checkers, efficient insulation wherever practical, have combined to place combustion of fuel under most perfect control, with a consequent high degree of efficiency.

Significance of slag constitution is appreciated fully, and every effort is made to produce steel free from injurious nonmetallics and gases. In some foundries open hearth steel is used for exceedingly light castings. In one foundry recently visited, many thousands of castings weighing 10 to 12 pounds each, and of thin section, were being produced, the melting unit in use being a 30-ton open hearth furnace. The castings were of excellent quality and appearance, and the percentage of misruns low in relation to the total of castings produced.

Although it is generally accepted the open hearth is, par excellence, the process for heavy castings, the American edition of it, equipped with modern control apparatus, is quite capable of taking care of a wide range of sizes of castings.

The great bulk of steel produced from electric furnaces is made on acid linings. For certain special purposes basic linings are utilized, but such cases are rare. The characteristic recommendation for the electric process is its ability to make small charges of varied analyses, hot and fluid, for the smallest of castings. It is natural that the main developments of the process have been in foundries dealing with light work or that calling for alloy compositions easily produced in the electric furnace.

Machine molding methods and green sand development also have a bearing on the popularity of the process. With molds being produced at present-day speeds in green sand which depreciates on standing, it is obvious that both economy of space and success of castings are dependent upon a regular supply of steel at frequent intervals. The basis of rapid production is continuity, or the exclusion of waiting-time periods and consequent accumulations of waiting molds.

From that viewpoint, the converter might hold a preeminent position, but unfortunately the necessity for large proportions of expensive pig iron, and the apparently inevitable high melting loss, have combined to cause the wane of that process.

Use Cheaper Materials in the Electric Furnace

The electric furnace is filling the gap, being able to produce hot steel at frequent intervals, although not so frequent as the converter, while utilizing cheap steel, scrap and little or no pig iron, and possessing ability to melt with exceedingly low losses.

On the score of comparative quality of the product of the two processes, the author hesitates to be dogmatic. Carefully made converter steel is capable of producing perfectly good castings. However, the time periods associated with the vital reactions of the process are short, and possibility of the correction of judgment errors by the operator consequently limited. On that account, except where the converter is in good hands, the author would (*Please turn to page* 48)

Table I

Average of All Tests Made on Open Hearth Carbon Steel During 1930.

	Pounds per Sq. In.									
	Tensile Strength	Yield Point	Elongation per cent	Red. of Area per cent	C.	Mn.	Si.	P.	S.	No. Tests
January	73,540	40,408	29.10	50.02	0.24	0.68	0.31	0.044	0.038	29
February	73,480	40,000	29.30	51.29	0.25	0.72	0.32	0.040	0.034	23
March	73,681	39,160	28.84	50.50	0.25	0.68	0.30	0.040	0.034	44
April	72,880	40,100	28.73	52.33	0.25	0.74	0.31	0.042	0.036	48
May	70,784	38,451	27.89	48.35	0.23	0.64	0.32	0.044	0.035	29
June	72,780	39,500	28.75	51.61	0.25	0.66	0.31	0.042	0.038	33
July	71,980	40,173	27.80	49.90	0.27	0.66	0.32	0.044	0.040	13
August	71,104	40,291	29.66	47.15	0.26	0.74	0.31	0.042	0.039	12
September	70,240	38,557	30.60	47.72	0.28	0.79	0.33	0.044	0.040	13
October	73,220	40,190	29.60	48.60	0.25	0.67	0.33	0.042	0.038	25
November	73,318	40,988	27.70	44.91	0.26	0.67	0.31	0.045	0.039	22
December	71,909	42,568	30.29	47.01	0.25	0.67	0.29	0.039	0.032	12
Average	72,409	40,032	29.02	49.11	0.25	0.69	0.31	0.042	0.037	303

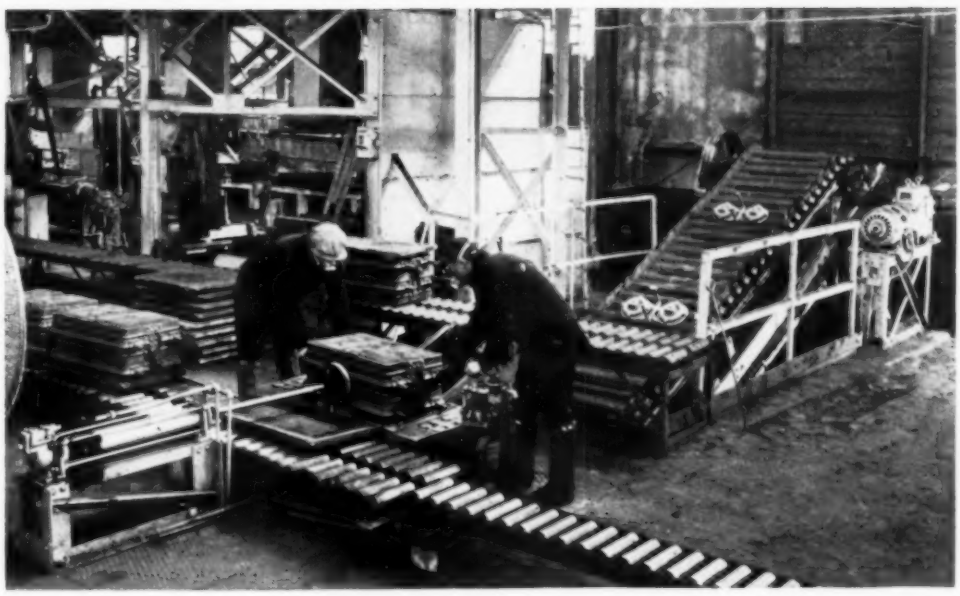


Fig. 1—The plunger pushes the flask from the bottom board to the shakeout table

Equipment Speeds Shakeout

General Electric foundry at Everett handles molds, sand and castings easily at station

OVER eight hundred molds of the type shown in the accompanying illustration are made and shaken out daily at the Everett, Mass., plant of the General Electric Co., on a gravity roller conveyor system with sand handling equipment installed by the C. O. Bartlett & Snow Co., Cleveland. End shields for electric motors are molded two in a flask, and the style of gate may be noted on the castings in transit on the inclined conveyor in Fig. 1. Iron, poured down the sprue at one side of the cope, travels across in a runner at the joint and allows any slag or foreign material to float up into a relief sprue at the opposite side of the cope. The clean iron flows through two shallow branch gates which run from the bottom of the runner into each mold.

Less Than Half a Minute

The shakeout mechanism, supplied by the Stoney Foundry Engineering & Equipment Co., Cleveland, and shown in the left foreground of the same illustrations is capable of handling a mold every 24 seconds. The platform of the shakeout table is flush with the top of the bottom board under each mold and in that manner the bottom board remains on the conveyor when the flask is pushed to the shakeout table.

As each flask arrives at the shakeout station the operator shown at the right opens a valve which causes the plunger in a small air cylinder to push the flask forward. Reversing the valve draws the plunger back in readiness for the next flask.

Separates Sand from Castings

A second valve admits air to a pair of 3-inch vibrators, one at each end of the device, and the sand and castings fall through an opening to a grating set at an incline. The sand falls through the grating to a belt which returns it to the reconditioning system and the castings slide downward to an inclined conveyor shown at the back of the illustration. They fall off the upper end of this conveyor and into trucks which convey them to the cleaning department. The empty flasks are placed on the roller conveyor in the background and returned to the molding station.

Castings made on this unit vary in size and as a result the shakeout device is equipped to handle flasks ranging between 16x28 inches and 20x38 inches. (*Please turn to page* 49)

Molybdenum in Gray Cast Iron

Affects transverse, tensile and fatigue strengths, impact resistance and hardness

By J. KENTSMITH
and
E. R. YOUNG

MOLYBDENUM, when incorporated with gray iron, increases the transverse, tensile and fatigue strengths, impact resistance, and to some extent the hardness. It does the latter at no expense of machinability since a gray iron correctly alloyed with molybdenum is machined more easily than a plain gray iron of the same hardness and as easily as one 15 to 50 brinell softer. Resistance to abrasion of a normal gray iron is increased considerably by molybdenum, hence the widespread application of that alloy in brake-drum irons.

Base Iron Is Important

Extent to which it brings about the varying forms of betterment is controlled rigorously by the base iron with which it is incorporated, and must not be expected automatically to result from indiscriminate use. Broadly generalizing, the better the iron base the greater degree of improvement is conferred upon it by molybdenum. No alloy can or should be expected to remedy poor melting and casting practice.

Consider the fundamental grounds from which spring improvements conferred by molybdenum upon gray cast iron, which latter metal has been likened to an impure steel containing the nonmetallic inclusion graphite.

The late Dr. Moldenke maintained that the graphite inclusion was in the light of its amount, formation, and disposition, the supreme determinant of the ultimate quality of gray cast iron. Since no metallic alloy can be expected to unite with such a nonmetallic inclusion a deadlock would appear to result. Fortunately graphite is a product of formation, being precipitated by internal reaction at temperature near the solidifying point of the liquid metal, and its mode of formation and dispersal is affected profoundly by its concomitants; some of these favor its formation and easy agglomeration with a result-

Table 1

Typical Nature and Dispersal of Graphite in a Molybdenum Gray Cast Iron

	CHEMICAL COMPOSITION									PHYSICAL PROPERTIES			
Type	Total Carbon	Combined Carbon	Silicon	Manganese	Nickel	Chromium	Molybdenum	Sulphur	Phosphorus	Brinell Hardness	Transverse 1.20 x 12-inch Centers	Deflection Inches	Tensile Strength pounds per Sq. In.
Cupola	3.40	....	2.30	0.67	0.95	0.55	0.65	0.08	0.19	255	....	....	46350
Electric Furnace	3.09	0.85	2.24	0.58	....	....	0.35	0.10	0.20	255	6000	0.16	47000
Cupola	3.27	....	2.26	0.70	1.65	0.14	0.57	0.06	0.19	293	....	....	48950*
Air Furnace	2.45	0.63	2.45	0.55	....	....	0.35	0.05	0.17	269	7935	0.17	52350*
Air Furnace	2.59	0.32	3.30	0.97	0.96	....	0.86	0.04	0.14	285	7520	0.19	53600*
Electric Furnace	2.34	0.66	2.06	0.66	0.14	....	0.50	0.04	0.18	248	6050+	0.14+	54780
Electric Furnace	3.09	0.67	2.06	0.67	0.65	....	0.70	0.08	0.16	248	5190	0.11	54800
Cupola	3.00	0.66	1.90	0.68	....	....	0.98	0.10	0.20	....	4760	0.10	56600
Electric Furnace	2.76	0.69	1.80	0.64	0.70	....	0.57	0.07	0.10	269	5900	0.13	60720
Electric Furnace	2.21	0.66	2.48	0.46	0.20	....	0.52	....	0.18	260	7830+	0.153+	63000
Electric Furnace	3.25	....	2.39	1.08	0.75	....	0.70	....	....	241	....	....	66500
Electric Furnace	3.04	0.72	2.24	0.63	1.20	....	1.71	0.08	0.16	293	5250	0.10	67000
Air Furnace	2.43	....	2.32	0.51	....	....	0.46	0.05	0.16	277	....	....	71150
Electric Furnace	2.54	0.30	2.30	0.47	0.15	....	0.50	0.05	0.19	....	6500+	0.145+	....

*Cast to size tensile test bar. +Calculated to 12" Centers.

ing weak, soft and fragile metal, others vigorously prevent its formation with a resulting hard and brittle metal.

Molybdenum neither inhibits nor promotes its formation in normal metal but does prevent, probably by reason of its solid solution afterward called its agglomeration, with the result that gray irons alloyed with molybdenum are distinguished by finely and completely dispersed graphite in ball and hook form—a form which does not disrupt the continuity of its surrounding matrix and hence does not give rise to the fragility which must accompany the presence of interfering plates of a weak nonmetallic inclusion. The typical nature and dispersal of graphite in a correctly made molybdenum iron is shown in Fig. 1.

Focus on Metallic Matrix

Fig. 1 shows the exact state of the graphite inclusions where the camera is focussed correctly on the metallic matrix. Should the latter be thrown out of focus and the sharp edges of the graphite remaining after the polishing operation be the lines brought into true focus, a false result would be obtained as in Fig. 2, which is a reproduction of a photograph of precisely the same field as Fig. 1 but incorrectly focussed.

Metallic portion of the gray iron must consist primarily of carbide of iron and ferrite, which

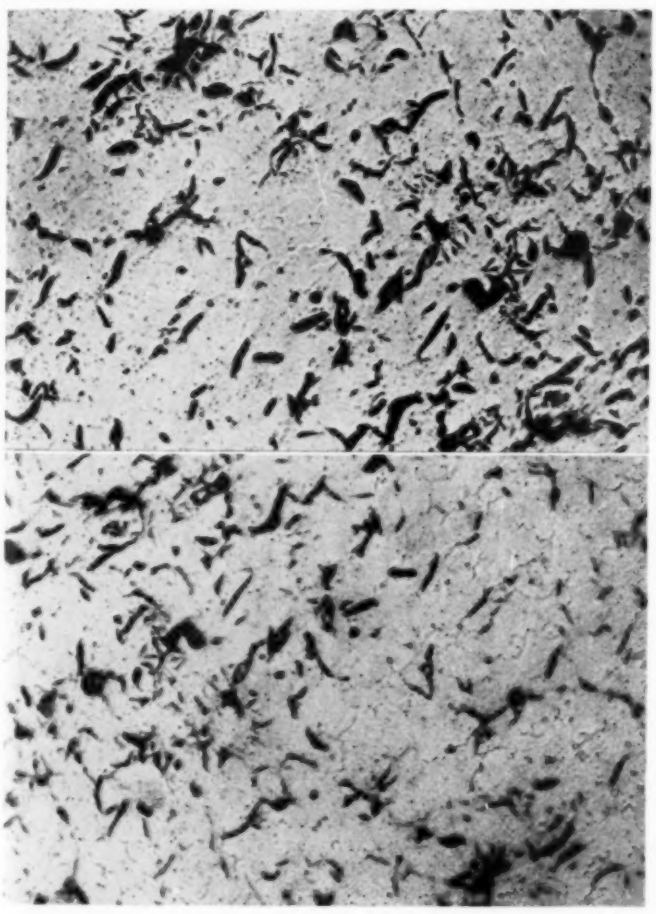


Fig. 1—(Above)—Graphite in unetched molybdenum gray iron-X 100. Fig. 2—(Below)—Graphite in unetched molybdenum as improper focussing would make it appear

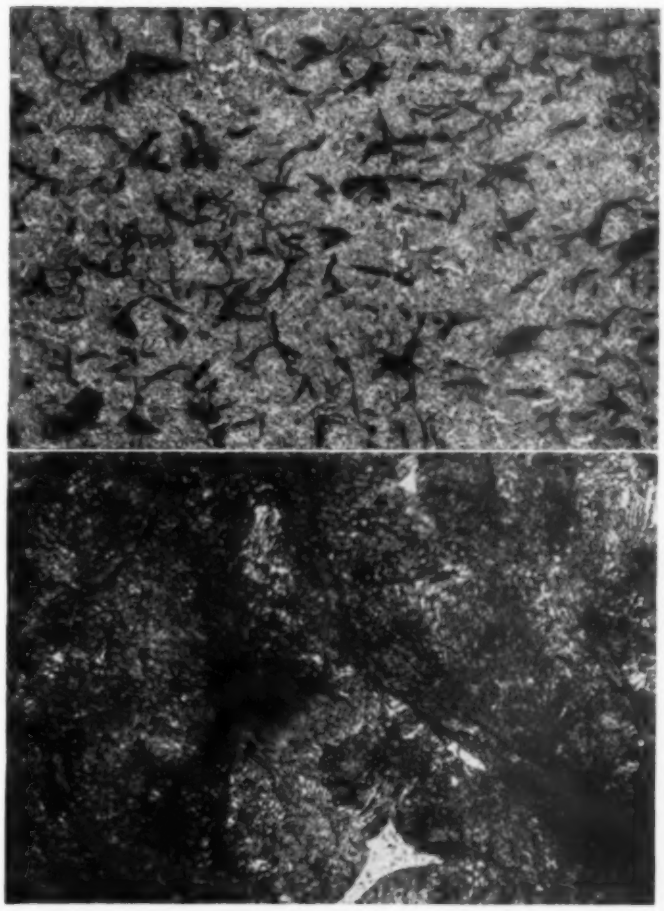


Fig. 3—(Above)—Typical pearlitic and graphite distribution in molybdenum iron, etched with nital-X 100. Fig. 4 (Below)—Lacy structure of pearlite, X 500

according to their proportions exist as the alloy pearlite (constituted by the alloying of complex carbide of iron and ferrite) and excess ferrite, or of pearlite and excess cementite. Most alloy additions have a one-way action, that is they enter into combination with the carbides, or into solid solution in the ferrite. Molybdenum on the other hand takes both ways proportionately. As a result it gives a strong and resistant ferrite, and a carbide stronger and better disseminated than normal. The differentiation of the two by suitable etching as they exist in a high grade molybdenum cast iron is shown well in Fig. 3, while Fig. 4, (at a higher magnification) illustrates the completely lacy nature of characteristic molybdenum pearlite, a kind of pearlite deductibly and demonstrably wear resistant.

Note Additional Improvements

As the use of molybdenum in cast iron of all varieties has grown and extended into new fields, and as data have been accumulated, there appear in addition to the increase of strength, etc. already itemized, two outstanding characteristics in the alloyed iron. These add notably to benefits of molybdenum from the practical foundryman's viewpoint. They are refinement of grain size, that is of structure both macroscopic and microscopic and increase of toughness or impact strength. (*Please turn to page* 58)

Fig. 1—Large rectangular flange cored out underneath to avoid inequalities in section

Design Influence on Brass Castings

Fundamentals of practice must be considered if sound castings are secured in the foundry

By LEWIS H. FAWCETT

ENGINEERS responsible for design of castings required in engineering projects give careful consideration to the composition of the alloy selected and its mechanical properties, with sufficient allowance for the proper factor of safety. However, in many instances the same consideration has not been given to the foundry problems involved in the production of the casting, and their influence on the ultimate value of the casting.

Need Concise Casting Data

Unfortunately, reliable data on that subject not always are obtainable readily in concise form for use of designers. It is the purpose of this article to outline briefly some of these problems and to present some simple illustrations of good and poor design for brass and bronze castings.

In selecting an alloy, consideration should be given not only to meeting requirements of design but also to aid production and minimize foundry difficulties. When possible, an alloy should be selected permitting use of a minimum amount of gates and shrink heads to obtain maximum yield from metal melted.

A brass with high shrinkage may have a low intrinsic value and yet have a high manufacturing cost, due to excess metal needed for heads and gates and additional molding necessary when using such an alloy. Such a brass would have a tendency to form scurf on its surface; but, in general, it would have a fairly uniform grain size so that the interior metal would about equal the surface metal in soundness.

A bronze would give a smooth, even, close-grained surface of uniform pleasing color and be produced with less molding labor and less excess metal in heads and gates. The bronze casting, however, probably would have a relatively coarse-grained interior structure as compared with the structure of the casting's exterior surface.

Table I gives the composition and mechanical

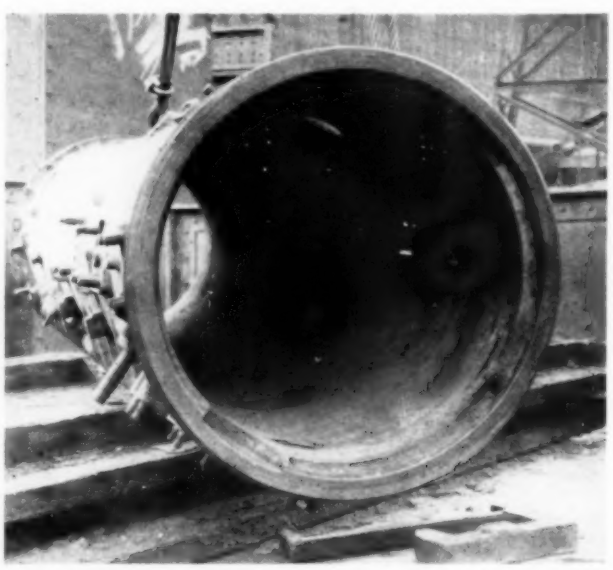


Fig. 2—Large bronze cylinder of good design secured through co-operation between designer and foundrymen

properties of two well-known bronzes, and similar information regarding brass is shown in Table II.

The cylindrical bushing shown in Fig. 3, if made of bronze, in all probability would be cast in a vertical position, as shown in *A*, Fig. 3. The shrink head would be placed on the top flange. This, of course, does not give ideal conditions during solidification, as the metal must feed the bottom flange through the relatively thin cylinder. The thin section would solidify before the bottom flange and thus cut off the supply of liquid metal during the latter part of the freezing period of the bottom flange.

How Leakers Can Occur

Nevertheless, the procedure would result in a satisfactory casting, and if too much metal was not removed in machining, the casting would withstand a high hydrostatic pressure. If a large amount of the fine-grained surface metal was removed by machining, it probably would leak (under water pressure) at the junction of the side wall and bottom flange, due to the relatively coarse-grained interior metal allowing the water to seep through. By surface metal is meant the metal in contact with the sand; the interior and exterior of the cylinder would be alike in this respect.

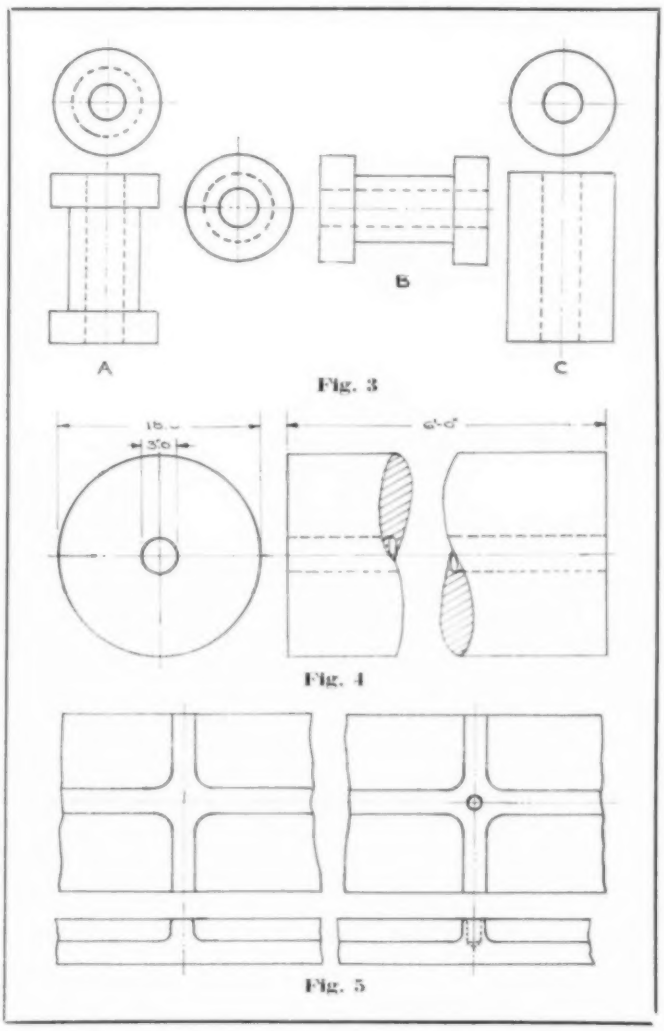


Fig. 3

Fig. 4

Fig. 5

Fig. 3—Simple bronze cylindrical bushing. Fig. 4—Exaggerated example of casting made more satisfactory of brass than bronze. Fig. 5—Rib intersection, poor design at left. Good design at right

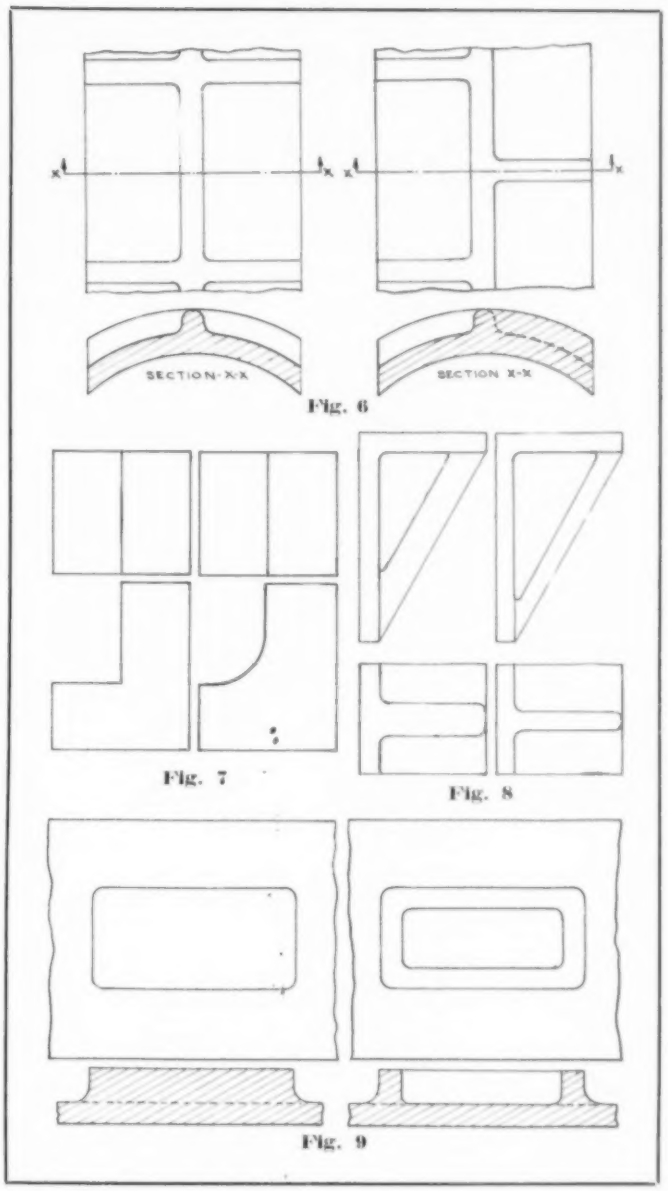


Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 6—Example of staggered ribs designed to avoid intersections, at right. Fig. 7—Good design of intersection, at right. Fig. 8—Method of correcting faulty bracket design, at right. Fig. 9—Good design for bolting plates, at right

Feeding for Shrinkage

To insure more perfect feeding the cylinder may be cast horizontally, as shown in *B* of Fig. 3. In that case a head would be located on top of each flange. The thin body of the casting would solidify before the end flanges, but liquid metal in the head would be available for feeding the flanges during the entire time of solidification.

If the casting was as simple as the one shown in the sketch, it could be cast in that manner. However, many castings which involve those principles have a much more complicated contour, and it is more practical to pour them in a vertical position.

If the bushing was to be made of brass or

manganese bronze (a high-shrinkage brass), it would be more satisfactory to pour a hollow, cylinder as shown in *C* of Fig. 3. That method would insure perfect feeding, as the casting is of uniform thickness throughout. Furthermore, it would allow the dross to rise and collect in the shrink head above without any tendency to be trapped in corners.

The cylinder then could be machined to the contour of the bushing. The machining would

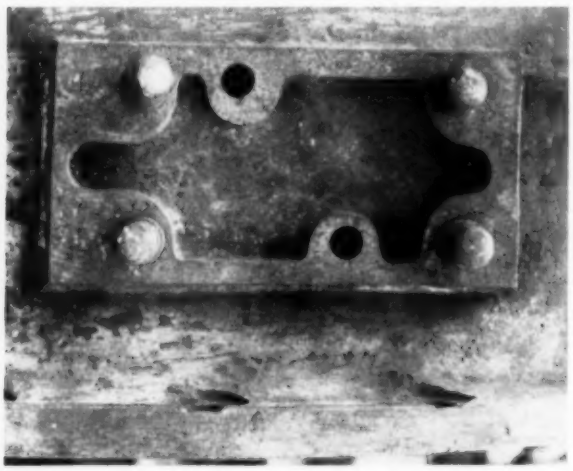


Fig. 10—Avoiding sharp corners in large bolting pad by coring out pad

remove any scurf that might be present on the surface and would not affect the ability of the casting to withstand hydrostatic pressure because the metal does not have a tendency to form a relatively coarse-grain interior, as compared with bronze.

Considering all factors involved, it probably would be more economical to make the bushing of bronze rather than of brass—especially where the casting is required to withstand water pressure.

Where Bronze, When Brass

Fig. 4 shows an exaggerated example of a casting that would be made more satisfactorily of brass than of bronze. The casting is 18 inches in diameter, 6 feet long and has a 3 inches diameter hole which is to be cored out with sand. The result is a large volume of metal surrounding a small area of sand. The metal is, in turn, surrounded by the refractory sand of the mold which, of course, retards its rate of cooling.

If that job was made of bronze there would be a tendency for *tin sweat* to penetrate the sand core, making the removal of the core extremely difficult and resulting in a hard, irregular surface within the hole. Tin sweat is hard and difficult to machine. It frequently has a tin content of about 20 per cent, but may run higher or lower than that figure. Other things being equal, the higher the tin content of the bronze, the greater the tendency to form tin sweat.

The ideal casting should be designed to have the same cross-sectional area throughout at the time of pouring. Of course, such uniform thickness is not to be expected in most castings but should be provided wherever practical. At times the allowance for machine finish may cause non-uniformity, although the final machined article may be uniform.

When uniform cross-sections are not possible, an abrupt change from one cross section to another should be avoided by the liberal use of fillets, which will eliminate right-angle bends and sharp corners and greatly aid in the production of sound castings. Wherever sudden changes in section occur, the lighter section may have completed liquid shrinkage and solid contraction

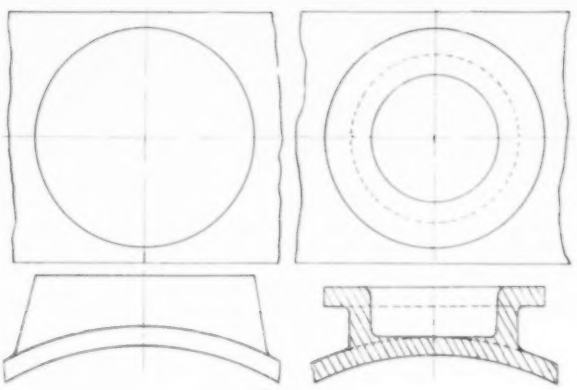


Fig. 11

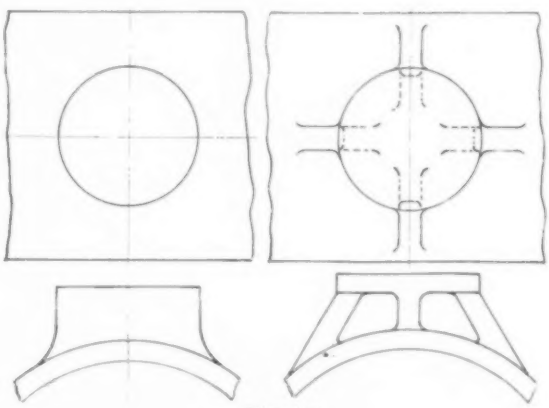


Fig. 12

Fig. 13

Fig. 11—Good design for projection on cylinder at right.
Fig. 12—Good design of bolting pads on cylinder, at right.
Fig. 13—Round flange in center and small boss at right

started, whereas the heavier section may still be in the liquid shrinking status, resulting in a rupture or strain at the union of the two sections if proper fillets or brackets are not employed.

When it is necessary to attach lugs, bosses, brackets or other projections to the body of a casting, uniformity of metal should be maintained as far as practical, even though it requires the coring out of such projections. An intended solid boss, attached to the casting, may be weaker than a lighter boss that has been cored out but is entirely sound.

Uniform cross section, proper use of fillets, rounded corners, coring of heavy lugs and bosses, the avoidance of sharp corners and right angle bends are details of design that greatly aid in the manufacture of sound castings at all times.

Furthermore, in the interest of sound castings it is essential that the designer visualize the various molding methods applicable to his design so that he may make modifications which will permit the proper feeding of all the principal parts of the job, or which will result in lightening the casting.

If the designer does not have sufficient knowledge of molding practice for such a survey, it is strongly recommended that he consult a foundryman and obtain his suggestions in the interest of soundness, prior to the completion of the design. Conferences between those producing castings and the designer often have resulted in production of difficult and intricate castings which otherwise might have proved a failure.

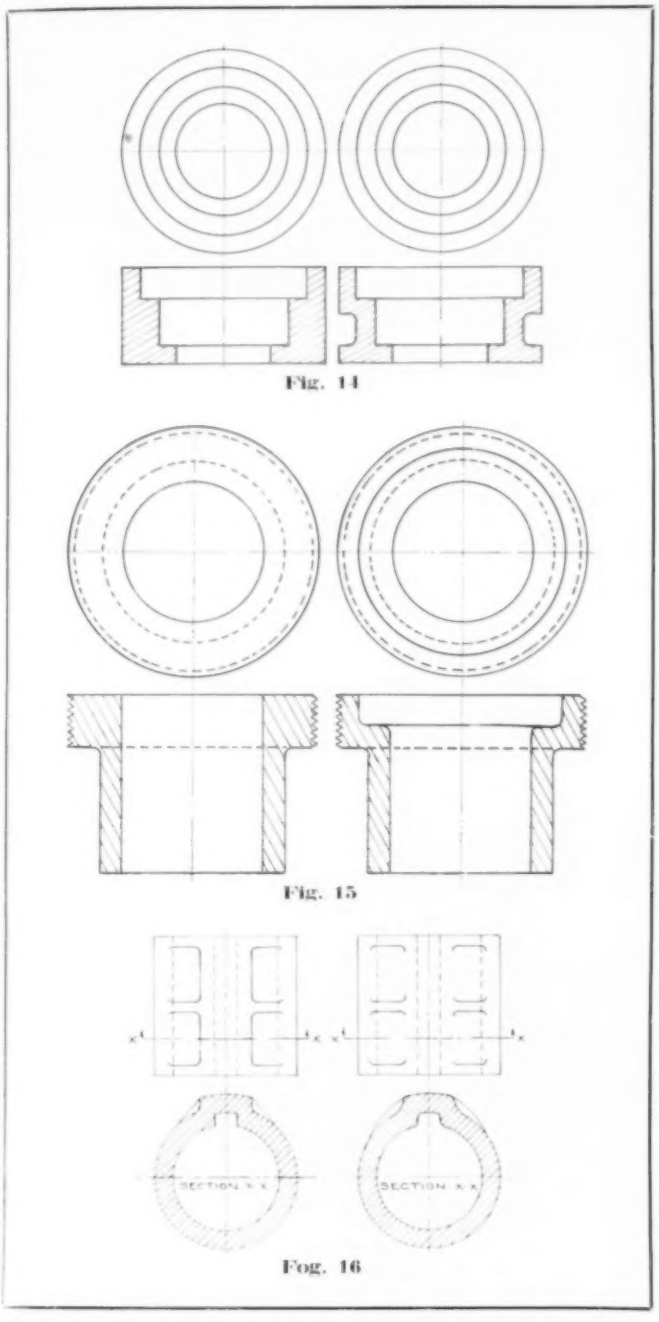


Fig. 14

Fig. 15

Fog. 16

Fig. 14—Greater strength was obtained by lightening the casting. Fig. 15—Good design for threaded collar, at right. Fig. 16—Good design for keyway, at right

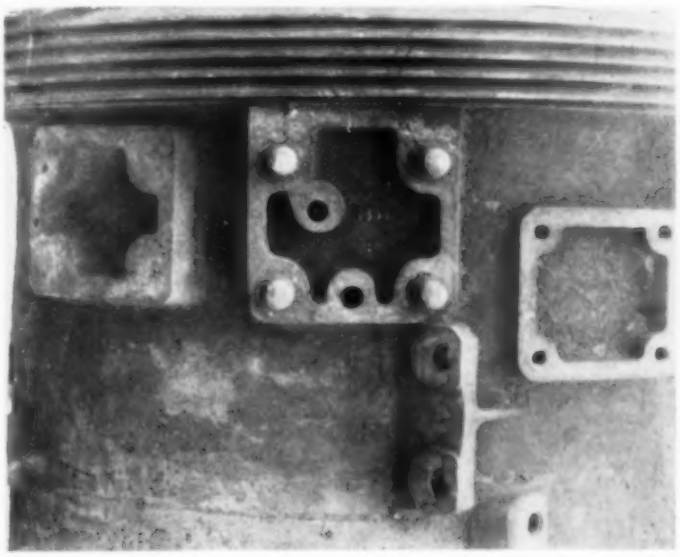


Fig. 17—Design showing care taken to avoid inequalities in section of casting

Frequently, patternmakers are reluctant to put ample draft on patterns when the drawing shows straight sides and the patternmaker does not know whether draft would affect the finished product. When possible, the drawing should specify a taper or authorized draft.

Sufficient draft will aid in the removal of the pattern from the sand without undue rapping, with the result that the sand will remain firm and thus obviate inaccuracy in the dimensions of the casting. Proper draft results in the casting being a truer replica of the pattern, decreases losses due to mold troubles, and is one of the largest factors in increasing production.

Accompanying sketches and photographs give some examples of good and bad design of brass and bronze castings.

Fig. 7 shows the intersection of two members of equal thickness. The sharp corner shown in poor design (at the left of the drawing) should be eliminated by a gradual tapering from one section to the other, as shown in the good design to the right. At times (*Please turn to page* 61)

Eastern Malleable Jobbing Foundry

Anneals castings in short time with oven fired by powdered coal

INSTALLATION of a modern type annealing oven fired by powdered coal marks the latest step in the evolution or progress of the Meeker Foundry Co., Newark, N. J., one of the oldest malleable foundries in the United States. Practically every change or improvement in the technique of malleable iron casting production has been reflected in the shop at 95 Clay street, the same site where Ira M. Harrison and David M. Meeker set up the first modest establishment in 1843.

Descendants of the original David Meeker still are active in the management of the plant and they in turn point modestly, but with a commendable degree of legitimate pride to the fact that many of the present customers have been customers for the past 50 years. A prominent manufacturer of shade rollers has been getting his castings from the Meeker foundry for over 50 years. Patterns for these and other castings of a somewhat similar character are mounted on plates and made on a mass production basis.

The foundry may be described as a jobbing malleable iron foundry specializing in light castings and particularly in castings which later must be bent or twisted in further process of manufacture. Frequently a distinct advantage is gained by casting several parts as units and then assembling them by slipping one part over another or by bending an outer part to enclose one or more other parts and thus make a complete unit. In other instances an economic advantage is gained by molding a casting in one shape and later twisting it during the process of assembly.

Maintain Even Volume

An exceedingly diversified output has helped to maintain a relatively even order book during the recent unsettled period. In seeking new business the company endeavors to get new industries represented and has been particularly interested in keeping the business in any one field from assuming the proportions of a monopoly.

To supplement diversified lines of jobbing work, a few stock articles fill the gaps in the operating schedule. For examples swivels are made in various styles and sizes. The bolt piece is cast first, cooled and cleaned. The shank or bearing is coated with sand and the bolt is

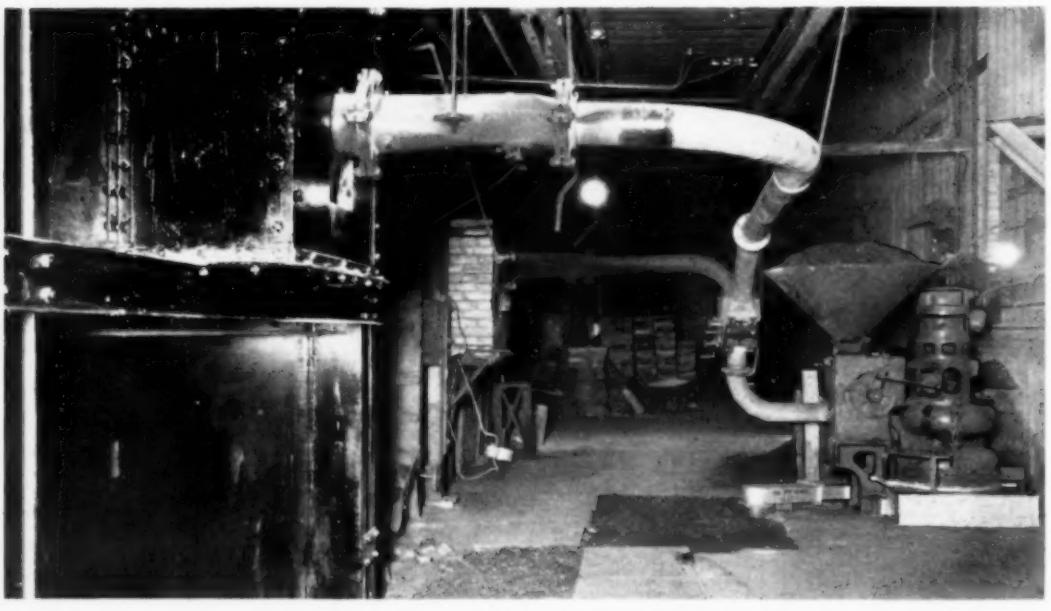


Fig. 1—The air intake for the powdered coal unit is under the car in the furnace

placed in the swivel mold. The loop or second part of the swivel then is cast around the shank. After they are cleaned and annealed, the two parts are free to turn independently of each other.

Castings at present running through the plant include wrenches for a wide variety of special purposes, ticket punches, door opening devices, rocker arms, castors and other furniture and building hardware, bottle openers, butchers and canners equipment, including a special tool for taking the ligaments out of turkeys.

About 25 molders are employed and the daily heat is about 8 tons. Nearly all the molds are made on a standardized jolt squeeze type machine from the Adams Co., Dubuque, Ia., and specially designed for light work. The molders are paid on a piece rate basis and each pours off his own floor.

The company has a rather unusual method of taking care of the miscellaneous odd jobs incident to foundry operation, loading and unloading the tumbling barrels, cleaning up, charging and cleaning the furnaces, cutting the sand, etc. This work is done by a so-called floating gang of five, six or seven men, depending on the amount of work to be done. This special gang takes care of a definite set of jobs on a piece rate basis, determined by the daily output. When that part of the work is done that gang checks out on that part of the schedule and checks in on an hourly rate in the cleaning room.

Establish Regular Routine

Sequence of operation through the plant is common to small foundries. All molding ceases at 4 p. m. when each molder proceeds to pour the iron required on his floor. When the iron is poured the molder's day is done. The molds are dumped quickly by the floating gang assisted by all available piece rate workers in the shop. After this the floating gang separates the castings from the sand and leaves the castings in small piles on the gangway.

In the morning, the castings are collected. The gates and risers are broken off and carted to the vicinity of the furnaces. The castings are taken to the cleaning department where they are sandblasted or tumbled as requirements dictate. Cleaned castings are piled on a long table for inspection and sorting. Afterward the accepted castings are taken in tote boxes to the nearby annealing department.

Castings destined to be bent or twisted are packed with an oxide packing material in the annealing pits. This packing material usually is rolling mill scale. The effect of the packing material is to slightly decarbonize the surface of the casting and thus increase the strength of the skin. However, this surface is less machinable. Carbon close to the surface acts as a lubricant for the cutting tool. Attempt is made to adjust the packing material in conformity with the treatment to which the casting is to be subjected. Many castings are packed in ground slag from the furnaces.

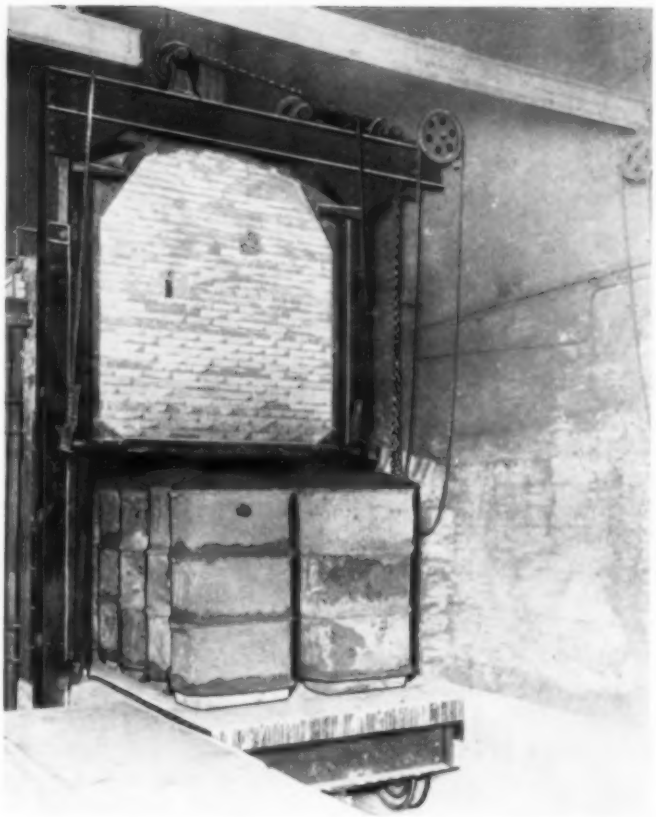


Fig. 2—The door is raised and the loaded car pulled into the furnace

In the annealing department the pots 18 x 18 x 30 inches are filled with castings, mill scale or slag, shaken down with a pneumatic vibrator and built up three-high on the car which conveys them into and out of the annealing oven. The car has a capacity of seven double rows of pots, each row three-high, or a total of 42 pots. The bottom pot rests on a cast stool plate and the joints between the pots are luted with clay. A chain hoist suspended from a monorail is employed for lifting the pots to and from the car, which operates in a depression in the floor. The top of the car is approximately flush with the shop floor, an arrangement which greatly facilitates loading and unloading.

The brick top of the car forms the floor of the annealing furnace when the car is on the inside. Projecting members form a sand seal at the sides. The furnace door rests on the top of the car and completes the sealing. All mud daubing has been eliminated.

The new annealing furnace referred to here and shown in the accompanying illustrations takes the place of a former furnace nearly twice as large. The new furnace cuts annealing time approximately one- (*Please turn to page* 50)

Classify Materials in Foundry Yard

To eliminate chance of error and control definitely production of quality castings

By E. H. TRICK

FEW foundrymen realize upon what a precarious foundation their desired casting qualities rest. Laboratory analysis of the product is the scientific way of foretelling possible service qualities, but since relatively few jobbing foundries possess a laboratory or employ a chemist, the rule of thumb method still persists.

Large firms, especially those manufacturing standard goods or patented specialties for which the demand is voluminous and sustained, can afford to equip and maintain adequate laboratories. The common, garden variety jobbing foundry, free lancing among a host of others, particularly if unsupported by a machine shop to put added value into the castings, often cannot afford the service of a chemist. Many jobbing foundries cannot afford even the periodic services of commercial laboratories serving all comers.

Debt Acknowledged to Others

However, the cloud has a silver lining; the accounts published and proclaimed far and wide, of the experiments and research carried on by those who have the facilities and money to do it. Thanks to their generosity this great mass of information is available to those unable to dig it out for themselves.

Whether disseminators of that information are actuated purely by altruistic motives is beside the point. Any person can realize that a small foundryman operating by rule of thumb does not know his costs any better than he knows a lot of other things. He constitutes a thorn in the flesh of the foundryman who does. Broadcasting essential information is a method of self defense. The little fellows must acquire enough by mere absorption to raise them eventually to the plane of decent competition: a condition to which the larger foundryman cannot and will not object.

Attendance at regional meetings and great general conventions of foundrymen serves to emphasize that fact. Lack of knowledge of the fundamentals of the business is appalling. One wonders how some foundrymen can stay alive!

Far be it from me to belittle the rule of thumb method for foundrymen, or for any other men. Experimental knowledge is the basis of all science. Scientific knowledge is nothing more than a system of organized facts each one of which was demonstrated experimentally at first.

Information readily is available. Certain factors contributing to the make up of castings of a definite quality, easily are obtainable. Firms selling pig iron will furnish an analysis of its composition. This information is reliable. Coke analyses usually are reliable. Of course these two pieces of information are insufficient in themselves. Practical experience must keep step

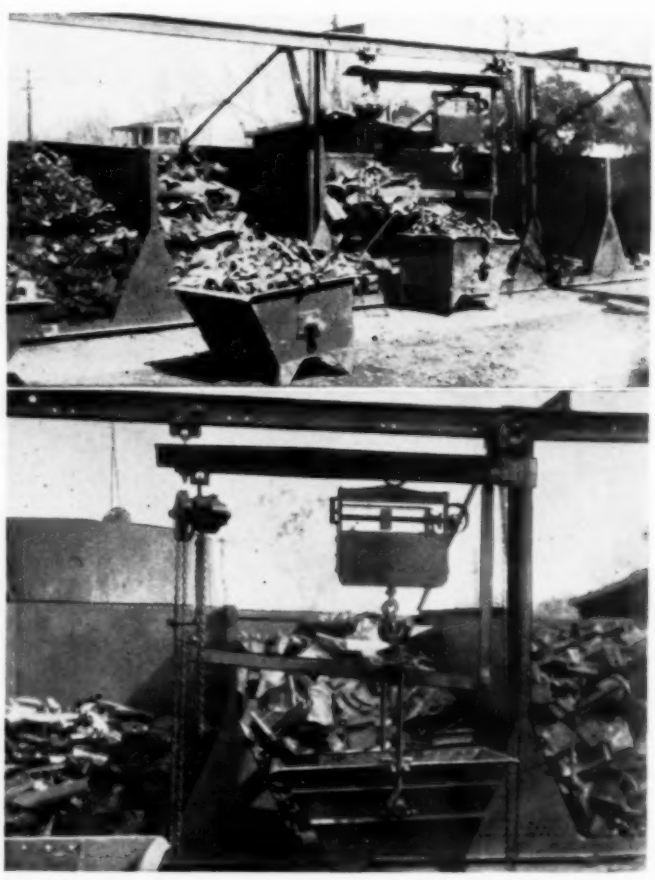


Fig. 1 (Above)—General view of bins and loaded tubs. Fig. 2 (Below)—The weighing device is suspended from the trolley carrying the containers

all the way. If sandbed pig is used it must be broken to a size suitable to the cupola condition. Knowledge of analysis alone will not control the melting. If the pickers at the coke delivery belt have a bad night you may get some coke with dirty ends. When this goes into the cupola the unfinished coking process is resumed. A clinkerage develops and cold spots occur.

The volume of air, size and number of tuyeres, their height above the bottom, and a number of other things enter into correct cupola practice, and influence the characteristics of the product. Inability to produce castings of a desired quality seems to originate in selection of materials to go into the cupola.

Graded Scrap Is Similar

Practical foundry operating experience extending over a long period shows that carefully graded gray iron scrap bears a fairly uniform analysis. For instance, cast iron engine cylinders, flywheels, frames, pulleys, housings, etc., of a cross section of 1-inch and over will show practically the same analysis.

So much information is available concerning that class of scrap iron that the average foundryman, knowing the source of supply, easily can establish mean analysis to stand for that portion of his raw materials. The same holds for so called medium machine scrap of less than 1-inch in cross sectional thickness and a wider but just as clearly defined source of origin.

Chilled car wheels are considered a class unto themselves and their analysis easily is obtained. Likewise hard iron, crusher plates, grinding plates, etc.

Old automobile cylinders are of definite analysis; but only when stripped clean. If used *as is*, with valves, valve springs, cam shafts, bolts, etc., on them, due allowance must be made. This introduces a slightly complicated factor, but the analysis of every piece mentioned can be obtained. Practice and the determination to get to the bottom are the qualities required.

Heavy structural steel scrap conforms to standard specification; likewise reinforcing steel scrap, medium steel bar scrap and sheet cuttings. In fact, there is no class of material on which the foundrymen cannot obtain the analysis. A considerable degree of refinement can be worked into these matters if there is a will.

Having classified the materials in this manner the next step is to see that the separation is accomplished to within as close limits as practicable and the necessary means for their retention in that condition provided. An orderly and systematic method of caring for all incoming raw materials is prerequisite. A definite method of procedure must be established and maintained with inexorable severity. No let down for any excuse whatever must be permitted. A competent man in charge of the material bins should have a promising understudy. A change of operators can mess up the product and create uncertainties that will make an old man of the foundry foreman quicker than anything else that can be devised.

At the Alamo Iron Works, San Antonio, Tex., we feel that we have control of matters in front of the cupola. The situation is not ideal because the Southern Pacific railroad, eight tracks wide, lies between the cupola and our scrap yard! With this single handicap of distance, messed up with a grade crossing, and crossing gates, our method of procedure clearly is defined and is maintained inexorably. All metals, pig iron and most of the scrap in car lots are delivered to the scrap yard and unloaded with a magnet. In addition a lot of scrap is hauled in trucks —material gathered locally by regular junk collectors and others; much of it agricultural. The yard is equipped with a crane of the derrick type with a 60-foot boom which operates both the magnet and the skull-cracker. The skull-cracker house is built of heavy steel plates, of sufficient height to obviate the need of a cover or roof, and provided with a stout steel door.

Material in Bins

Nine stoutly built steel bins are arranged in close proximity and proper relation to the cracker house and the crane. These bins are 13 feet long, 5 feet wide and of widths varying as required by the different classes of material which they contain. They are open at one end and along and above these ends a trolley runs on a beam about 7 feet above the ground. A steel floor, about 5 feet wide, extends in front of the bins directly beneath the trolley. Each bin contains a certain carefully selected class of scrap, car wheels, stripped automobile cylinders, heavy machine scrap, light machine scrap, structural steel, sashweight materials, etc. The pig iron is stored in the bin next to the railroad track for greater convenience in unloading.

Incoming scrap is unloaded into one big pile from which it is sorted by experts and put into the several bins according to its classification. A considerable amount of the material arrives in usable size. Some can be broken with a heavy sledge hammer. The heavier pieces are lifted by the magnet and placed in the cracker house. They are broken with a heavy skull cracker and transferred by magnet to the proper bin. Rolled steel sections, bars, pipe and small shapes are cut under a heavy alligator shear. Heavier sections are cut with a torch.

Charges for the cupola are put up in welded steel tubs. All the same weight and provided with stout legs of just sufficient height to permit a lift truck to be pushed under them. Steel trunnions are welded on the sides and each tub is provided with a latch to prevent it from upsetting when picked up with a bail.

Each tub holds 2000 (*Please turn to page* 54)

Steel Founders Consider Pooling

Reach no decision on plan to keep one steel plant running in each of several districts

POOLING of steel castings business in the more important producing districts was discussed at a meeting of the Steel Founders' Society of America Inc., at New York, May 18, but no decision was reached. Steel casting manufacturers at Milwaukee, for instance, have been discussing the feasibility of concentrating their orders in one plant and keeping that running at a satisfactory rate. Those opposed believe that, from their own standpoints, it is best to keep their plants running at as favorable a rate as possible under present conditions in order to be in shape to get their share of business when demand revives.

A further reduction in demand for steel castings over the next few weeks was forecast by a majority of members, now operating at rates from 50 per cent down to almost nothing. Although repairs cost almost as much as new parts, it was pointed out that railroads are unable to get appropriations for new material, whereas occasional funds for repairs are made available. Concerning the ultimate recovery of the steel castings market there was no doubt, inasmuch as products are wearing out much more rapidly than replacements are being made.

Necessity Is Teaching Economy

George R. Casey, vice president, Treadwell Engineering Co., Easton, Pa., presided. He pointed out that necessity is teaching lessons in economy which should react beneficially to the steel foundry industry when it again enjoys the privilege of doing business on a satisfactory scale of operation. Mr. Casey expressed concern over lack of progress on the part of our governments, federal, state and municipal, to reduce expenses to a point where they can be met out of possible tax income.

Arthur Simonson, president of the Steel Founders' Society of America, and vice president of the Falk Corp., Milwaukee, deplored the present tendency to talk depression. From wondering when the depression was going to be over, said Mr. Simonson, a good many business men are rapidly convincing themselves that it never will be over. He advocated an abandonment of the defeatest attitude and recommended fresh cultivation of the spirit which made this country what it is.

Granville P. Rogers, managing director, Steel Founders' Society of America, gave statistics just compiled by the society, to show the effects of the depression on the steel casting industry. He pointed out the survey shows there are 263 companies in the United States and Canada operating 294 steel foundries, although 27 of these are reported not operating at present. The total number of active foundries is 267.

Shows Slight Capacity Shrinkage

A comparison of the 1931 figures on capacity with those of 1930 shows that in the United States the available capacity for production of steel castings by the principal melting processes decreased by about 66,000 tons, or about 2½ per cent. A slight gain in open-hearth capacity was recorded, converter and electric capacity showing declines. In Canada, capacity increased, with the exception of that of the converter group, where a notable reduction is observed.

Production of steel castings in the United States fell off about 542,000 tons from the total recorded for 1930, representing a drop of about 48 per cent. Open-hearth tonnage represented a drop of over 50 per cent. Electric production fell off 42.4 per cent, converter 41.5 per cent and crucible 41.1 per cent. The industry as a whole operated at 25.6 per cent of rated capacity during 1931, as against 47.9 per cent for 1930 and 68.3 per cent for 1929, while average production over a 10-year period prior to 1929 was approximately 56 per cent.

Average number of employes in the industry in the United States for the year 1931 showed a decrease from 1930 of a little over 10 per cent. Average number of employes in Canadian foundries increased a little over 2 per cent.

In the United States there was a drop of about 49,000 net tons in alloy steel castings production although alloy castings constituted a larger percentage of the total output of the industry, comprising 11.6 per cent of the total output.

The investigation (*Please turn to page* 49)

Cast Iron Lighthouse Marks Cape Henry

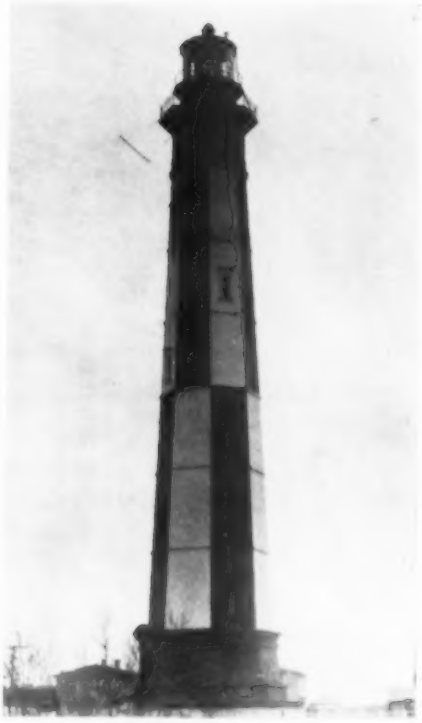


Fig. 1—Cape Henry light is one of the primary lighthouses and an important signal and radio beacon station

ON the night of Dec. 15, 1931 the cast iron lighthouse on Cape Henry, Va., completed 50 years of service. In absence of earthquakes, tidal waves or other manifestations of violent trouble inside the earth, it is altogether probable that the same lighthouse will be functioning as efficiently as ever on its hundredth anniversary.

Why not? It is immune to fire, a rapid, almost instantaneous form of oxidation. For all practical purposes it may be claimed that it is immune to corrosion, a slower but equally effective form of oxidation known under the common name of rust. After 50 years service the cast iron plates of which the structure is composed, apparently are as clean, as solid and as substantial as they were on the day they were assembled. They constitute an enduring testimony to the long life and service of cast iron.

Resistance to the furious storms that have swept over the Virginia capes during the past 50 years constitute a sufficient test of the inherent strength of the structure and the solidity of the lighthouse anchorage to a mass of concrete and masonry that extends 8 feet below the surface of the ground.

Cape Henry light may be dismantled at a future date through changes or improvements in methods of navigation involving the different types of signals, but so long as present methods endure, the existing lighthouse never will be scrapped through failure of construction or material.

Fig. 2—The outside shell of cast iron plates is connected through suitable brackets with the inner stair cylinder of wrought iron

At the Privateers Gateway

A masonry structure, a short distance from the cast iron building dates back to 1791, the first lighthouse erected by the Federal government. Erection of this lighthouse at the southern tip of the entrance to Chesapeake Bay gains a certain historical significance from the fact that Baltimore at the tide water head of the same bay was the recognized center of all privateering activities in the American colonies struggle for independence.

Virginia and the Chesapeake Bay district are more intimately associated than any other section of the country with American history. Here the first settlers came to Jamestown, May 13, 1607 and although there was no lighthouse on Cape Henry at that date to give them welcome, it is reasonable to assume that they breathed a sigh of relief when their little vessel passed the point and they realized their long sea journey was almost over.

During the Civil War, old Cape Henry light saw the MONITOR slip past one day on its way into Hampton Roads to curb the activities of the MERRIMAC and incidentally revolutionize battleship design and construction. The light served as a guide to the blockade runners, hovering on the inside waiting for a night sufficiently dark to warrant a dash for the open sea.

The present light (*Please turn to page* 56)

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, Charles Vickers.

Sand Packing Used for Annealing Malleable Cast Iron

What objection is there to the use of silica sand for packing the white iron castings in malleable annealing? Would there have to be any change in practice as compared to use of slag? At what temperatures are the doors opened with slag; with sand?

If the silica sand which you intend to use is highly refractory, there should be no trouble encountered in its use. If the sand is not sufficiently refractory it may fuse to the castings at the temperatures employed during annealing, and necessitate considerable cleaning to remove the fused material from the castings. At least one firm in this country uses ordinary gravel for packing material. The silica content, of course, is fairly high, and excellent results are obtained. There is no need to change annealing practice from that employed with slag. The doors usually are opened after the temperature has fallen to 1275 degrees Fahr., or slightly lower, and that will apply in the case of sand as well as slag packing.

Cavity in the Pig Iron Is Not Reproduced in Casting

We are forwarding for your examination a piece of pig iron containing a large cavity on top. Many of our castings show similar cavities and we are wondering if the pig iron is responsible.

Certain characteristics of pig iron survive the remelting process in the cupola, but the defect shown in the piece of pig iron submitted for inspection is not one of these. The outside of the pig shows that it was cast in a wet mold. The steam trapped some of the kish or free carbon escaping from the metal and held it long enough to form the peculiar cavity.

When this pig is remelted in the cupola it loses from 20 to 30 points in silicon. As part of a mixture containing comparatively low silicon scrap or steel, it loses still more silicon. The loss of silicon promotes the retention of carbon in the combined form as opposed to carbon that is free and that may be extruded as kish. The cavity in the pig is due to its composition and method of casting. In the cupola the composition is changed and a well made mold does not cause the metal to boil.

Defects in Cast Pinion Caused by Presence of Steam

We are forwarding a cast iron pinion 6½ inches in diameter, 3-inch face, with a 3-inch shaft opening in the center. The 11 teeth on this wheel are partly blocked out in the mold and later finished to correct size and shape on a gear cutting machine. Despite the application of practically every type of gate and riser, the casting shows one or more defective areas at the base of the teeth.

The defect in the casting has every appearance of a shrink which follows the presence of steam. The casting presents no particularly hazardous features and for that reason, practically any type of gate may be employed to introduce the metal. Basing our opinion on the evidence submitted we believe the defect is caused either by the use of unsuitable sand in the teeth, by lack of venting or by both. A possibility also exists that the pattern did not draw well, and the molder in his zeal applied the water too freely in patching a defective tooth.

Some obscure metallurgical factor may be responsible for the defect, but we suggest you try a few changes in the molding method and material before going any further. Mix a special batch of facing for the teeth by adding a shovelful of sharp sand to 10 shovels of your regular

facing. Before drawing the pattern from the sand, vent each sand tooth with an ⅛-inch vent wire and scratch a vent channel at the joint of the mold for the vent from each tooth to escape. Pour the metal through a high head, at least 6 inches, and preferably through two ½-inch sprues, one being located on each side of the cope core print.

Bronze Plate Is Split By Improper Venting of Mold

We are forwarding a section of a thin bronze plate casting which is split, sandwich fashion, through the center. This is typical of a condition which crops up in our castings every so often. We use the standard 85-5-5-5 alloy, and to run the thin castings, we have to overheat the metal. We add phosphor-copper shot before pouring, but separations and cavities occur frequently. Castings are poured in a torch-dried, green sand mold. We have been told that the trouble is due to oxidation from overheating the metal.

Overheating, or more properly superheating, the metal does not necessarily cause oxidation, if ordinary care is taken, and the operation is carried on rapidly. Therefore, you need not worry if the metal is melted rapidly and poured when it is ready. Examination of the specimen shows your difficulty is not caused by oxidation, but by improper venting. Use perforated bottom boards or plates that will allow the gases to pass from the mold without obstruction. Vent the plates top and bottom well, or use a much coarser sand, say a No. 2. A smooth casting may be made with the coarser sand by using a facing sand mixture which is composed of 1 part flour and 20 parts sand.

Size of Steel Casting Is Minimum Thickness Factor

We are operating a pattern shop, and one of our customers desires to have some patterns made for stainless steel (18-8 mixture) castings for pipe fittings for stairs, in front of windows, etc. He wishes to make the castings as thin as possible for the metal to flow. We do not have any information on the minimum thickness possible, and wonder if you can supply it. Also what is the shrinkage per foot for stainless steel, and the finish thickness to be allowed to make a smooth surface?

The minimum thickness for stainless steel castings depends upon the size of the pieces to be poured. With castings of small size and with proper steel-making equipment, sections ⅛-inch thick can be poured succesfully and 3/16 to ¼-inch can be run regularly in pieces not over 6 inches long.

Shrinkage allowance per foot for stainless steel patterns should be 5/16-inch, the same as for other high alloy steels. Amount of finish to be allowed to secure a smooth surface depends upon skill of the foundry which is to produce the castings. For small work, such as appears to be what is to be made in this case, ⅛-inch finish should be ample.

Use of High Tuyeres Permits Collection of Metal

For use in a hollowware shop I am about to rebuild a cupola 42 inches diameter inside the lining and with a number of 5 x 12-inch tuyeres 13 inches above the bottom doors. Should not this distance be at least 18 inches?

Height of the tuyeres above the bottom is not an important factor so far as actual melting operation is concerned. In some foundries where it is desirable to collect a considerable amount of iron in the well before it is tapped into the ladle, high tuyeres are necessary. In many stove plate foundries where the stream is kept running constantly, the tuyeres on a 42-inch diameter cupola may be as low as 4 inches above the sand botton. In your present installation, with a 6-inch sand bed, the tuyeres will be 7 inches above the bottom and that means the well will hold nearly 2000 pounds, if necessary, between taps. That means the cupola will have to be tapped about every 8 minutes, or kept running constantly. Tuyeres 18 inches above the bottom, will allow you to collect a larger amount

Work is progressing nicely on the buildings for a Century of Progress which will be staged in Chicago in 1933. The illustration shows the main facade of the administration building

of iron at one time, and give greater latitude between the intervals of tapping.

Iron Content Is High in Nickel Alloy

We are sending you a casting, spongy and full of blowholes, which was poured between 2250 and 2350 degrees Fahr. in No. 1 Albany molding sand with 160 to 170 fineness, 10 to 12 per cent clay, and 3 to 4 per cent moisture. Composition of the metal is 60 per cent copper; 22 per cent nickel; 3 per cent iron; 10 per cent zinc, and 5 per cent lead. We have tried a number of fluxes and degasifiers without success.

Iron sometimes is added to whiten nickel or german silvers, but 3 per cent is much too high, especially since the color should be white enough with 22 per cent nickel. Iron also increases strength, hardness, and to a limited degree, the elasticity of the alloys, but beyond 1.50 per cent tends to make them brittle. Hence, it is suggested that you reduce the iron content.

Presumably, you are heating the metal in the furnace to a temperature much higher than those mentioned. If not, that should be done to insure a thorough amalgamation of the various elements. While you state that you have tried several fluxes and desgasifiers, it is suggested that you try about 2 ounces of 30 per cent manganese-copper per 100 pounds of metal, or the same amount of phosphor-copper as a degasifier. For a cover flux, use just enough broken bottle glass to provide a thin coat over the liquid metal.

Turn Mold Boards On Edge To Be Poured

Are chill faced plow mold boards cast flat, tilted, or, on edge? Where are they gated? Are the bolt holes formed with sand or chill cores? Other items on which I should like to have information include: Thickness of the chills, coating employed, method of cooling the castings. Is it considered good practice to operate a cupola without limestone or any other form of flux?

Mold board castings for plows are molded horizontally and then turned up on edge to be poured. The drag part of the mold is an iron plate from 1½ to 2 inches thick with the face conforming to the drag impression of the pattern and extending far enough all around to form the parting surface and a bearing for the cope. In effect it is the same as a pattern plate. The back is hollowed in conformity with the face to insure an approximately uniform thickness of metal. The plate is provided with handles on the ends and with pin holes to locate the cope. The runner extends to the bottom where a single wide, thin gate admits the metal.

The face is scored with light indentations horizontally and vertically to hold the iron as it commences to congeal and these prevent hollow places on the face of the casting. These light ridges subsequently are removed in the grinding process to which the castings are subjected. Bolt holes are formed by small dry sand cores placed in prints in the chill. After the brittle castings are poured they are placed in brick lined pits and buried in hot sand for 36 hours.

Approximately 12 per cent charcoal pig iron is incorporated in the mixture from which the mold boards are poured. The silicon content of the castings ranges from 1.00 to 1.10 per cent, sulphur 0.10 per cent, phosphorus 0.50 per cent, manganese 0.75 per cent. An occasional thin coating of oil is applied to the chills. Needless to say the chills must be perfectly dry and clean. Limestone or other flux is not an actual necessity where the heat does not extend over 1 hour. However, even on short heats the addition of a flux will keep the furnace clean and reduce the amount of work required to get it in readiness.

Nickel Castings Need Feeding Risers

What equipment is necessary to produce nickel castings. Molding and gating practice for producing those castings would be appreciated if available. The maximum weight of the castings is 250 pounds with a metal thickness of ⅜-inch.

Nickel may be melted in crucible, open-flame, or electric furnaces. In the case of crucible furnaces oil-firing is necessary to produce the high temperatures required. The oil must be low in sulphur. Nickel may be purchased as nickel shot or ingots, and for castings should contain under 2 per cent iron; under 0.50 per cent manganese; under 0.03 per cent sulphur; 0.15 to 0.25 per cent carbon, and from 0.75 to 2.0 per cent silicon depending upon the size of the casting. Thin castings should be in the lower silicon range while heavy castings are in the higher range.

Raw nickel material is melted and the silicon added about 5 minutes before pouring. Stir well with a wood pole. Stick magnesium is used for a deoxidant and desulphurizer, and is added just before pouring. Use 1½ ounces per 100 pounds of metal, and see that it is plunged below the surface by using tongs or a perforated cup such as sometimes used for phosphorizing.

Risers and shrink heads should be placed to feed the castings, and made as heavy as nickel chills rapidly. Castings in which sharp changes in section occur should be chilled at those points to promote uniform cooling. Use as little binder as possible in the sand which must be refractory and open. For light castings try a mixture of 1 part No. 1 Albany sand, 1 part Jersey sand, and 3 parts old black sand. Mix with water or clay water so that it is just moist enough to hold together. Castings from 5 to 20 pounds may be made in a sand mixture composed of 2 parts old black sand and 1 part new No. 1 Albany. Heavy castings may be made in sand composed of one wheelbarrow each of Millville gravel, old black sand, and lumberton sand with one shovelful of flour.

Cupola Practice Causes Hard Castings

We have trouble in machining cotton mill repair castings for which the iron is melted in a 26-inch cupola. Charges are made up of 150 pounds shop scrap, 200 pounds cotton mill scrap and 150 pounds pig iron with the following analysis: Silicon 3.07 per cent, sulphur 0.03 per cent, phosphorus 0.55 per cent, manganese 0.75 per cent. Castings are hard, but clean and solid.

The mixture is too hard for small pulleys and other thin castings. An approximate analysis of the charge would show: Silicon 2.30 per cent, sulphur 0.05 per cent, phosphorus 0.55 per cent, manganese 0.60 per cent. Approximately 30 points in silicon are lost during the melting process, particularly if the blast is a little high. As a result, metal in the ladle probably contains 2.00 per cent or less silicon. This is altogether too low for thin castings poured in green sand.

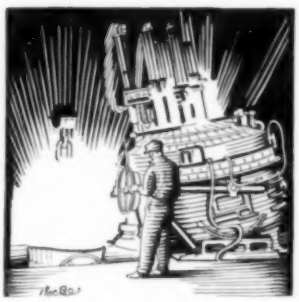
Either increase the proportion of pig iron in the mixture, or raise the silicon content of the mixture by the addition of sufficient ferrosilicon to show at least 2.50 per cent in the casting. For preliminary test try a mixture of 50 per cent pig iron and 50 per cent scrap, either shop or foreign.

White Metal Mixture Composed Mainly of Lead

Can you give information on a low priced white metal alloy which will not be attacked by sulphur in natural or artificial gas, to replace a zinc alloy which is too brittle. The castings are made in sand.

A white metal of the type desired is one composed of 87 per cent lead and 13 per cent antimony. If that composition is too soft for the castings, add more antimony.

Viewing Foundry Developments



At Short Range

BEFORE enlarging its field to cover concealed heating units, an eastern radiator manufacturer made a careful study of the objections raised to the various units on the market, most of which are of nonferrous metals produced by methods of fabrication other than casting. The engineering department then designed a cast iron radiator which meets each objection by some unique feature of design. Advertising, directing attention to the 12 special features, and stressing the durability of cast iron has resulted in a number of important sales, regardless of the fact that the cast iron equipment is from 20 to 50 per cent higher in price than installations made of nonferrous metals by other forms of fabrication.

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The use of cast iron for dies is capable of considerable development. Some years ago a western firm was pressing steel articles at a red heat using forged steel dies. The best steel dies would give but 3000 to 5000 pieces. Then cast sticks 5 inches in diameter by 3 feet long were made of cast iron of the following composition: silicon, 1.15 to 1.40; sulphur, 0.085 to 0.120; manganese, 0.50 to 0.80; chromium, 1.00 to 1.50; nickel, 0.40 to 0.60 per cent. Sections were sawed from these sticks and machined into dies. The service of these was much superior and in fact the last cast iron die used on the order made 60,000 pieces before failure.

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CALCIUM boride for some time has been used as a deoxidizer for copper that must have a high conductivity. However, recent experimental work indicates that it may have possibilities in the gray iron field. Additions of calcium boride to ladles of gray iron increased the tensile strengths from 21,000 pounds per square inch to 38,000 pounds per square inch. It is said that no alloying of calcium boride and iron occurs.

♦ ♦ ♦

Uniformity in sand is important. The effect of variation upon the character of castings is particularly noticeable in light, thin work. A piston manufacturer in rebonding varied the clay content less than 1 per cent. The resulting castings seemed to be satisfactory, but the machining time jumped to a point that the output was only 170,000 per day instead of 300,000 per day previously attained.

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As an aid to dust suppression in abrasive blasting operations a western firm has devised specially built pneumatic seals for the doors of all blast rooms. These are applied around the perimeter of the doors and intermittently operated tables. Interlocking controls make it impossible to operate the blasting equipment until all openings are sealed in position.

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WHILE advocates of welded structures to replace castings stress the point that lighter machines may be built with that type of design they are finding, much to their dismay, that disturbing noise and vibration problems are arising in some of those structures. Those problems have been accentuated by high speeds until they have become a serious matter in power machinery operations causing interference with the proper functioning of relays and meters on switchboards.

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One gray iron foundry has developed the use of the step-bar test piece to the point where the total carbon content of its metal can be estimated within 5 points. Other foundries find that chill test bars or wedge shaped bars are extremely useful as control instruments.

♦ ♦ ♦

A new process is being developed experimentally for making nonferrous rods directly from molten metal without rolling. This has been found effective up to diameters of 1½ inches and rods made of brass, copper or aluminum have a close dense structure said to be equal to the rolled product. The machine employs compressed air to force molten metal through a tube of refractory material, one end of which is submerged in the molten metal basin.

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ONE foundry making alloy iron brake drums by the duplex process has found that better control of structure is obtained by melting some steel in the cupola and charging the remainder into the electric furnace. The resultant iron if cast normally will have a white fracture, but by adding ferrosilicon in the ladle a gray fracture is obtained. Molybdenum as an alloying agent also is added in the ladle.

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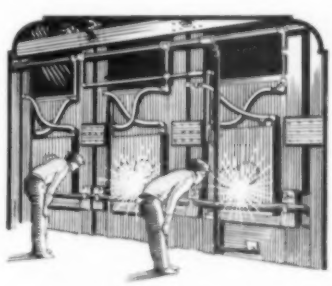
A British coal and iron company has built a cast-iron road leading to the coal mines. A layer of cast-iron plates instead of the usual ballast forms the foundation. The plates distribute the traffic load over a wide area and thus lessen subsidence. With the surface free of pot holes the foundation will not be subjected to the hammering of heavy traffic bumping over irregularities. The plates are ribbed to increase the strength,



also to assist in holding the plastic road material. Interlocking joints prevent displacement of the plates. Even if supported solely on two opposite edges, each plate would support a load of 4 tons. In actual practice the ability to support is greatly increased. With the commencement of deflection, the joint causes the weight to be taken partly by adjoining plates. The plates are laid ribbed side up, with their edges interlocking, immediately below the surface of the roadway. They are bedded on the foundation and against the curb. Approximately 1000 tons of plates are required per mile, at a cost approximately equal to that of a road built in the usual manner.

The FOUNDRY Family Photograph Album

Upper Left
N. W. PICKERING
Farrel - Birmingham Co.,
Ansonia, Conn.

Upper Right
E. R. YOUNG
Climax Molybdenum Corp.,
Detroit

Lower Left
A. C. ZIEBELL
Universal Foundry Co.,
Oshkosh, Wis.

Lower Right
J. S. ERVIN
Mackintosh - Hemphill Co.,
Pittsburgh

Men of Industry

Whose Activities Are Making Foundry History

JOHN A. MOORE, manager, the Acme Foundry Co., Detroit, recently resigned his connection with that company. Mr. Moore was born in Ottumwa, Iowa, in 1888 and completed his apprenticeship with the Fulton Foundry & Machine Co., Cleveland, in 1899. He then spent 5 years in the

John A. Moore

molding departments of various foundries throughout the country and in 1904 was made foundry superintendent, Oliver Mfg. Co., Knoxville, Tenn. He remained with that company until 1911 when he was made foundry superintendent, American Blower Co., Detroit.

From 1913 to 1918 he was connected with the Russell Wheel & Foundry Co., Detroit., from 1918 to 1919 with the American Blower Co., Detroit, and from 1919 to 1922 with the Russell Wheel & Foundry Co. For the next 5 years he was engaged in foundry consultation work and in 1927 was made manager of the Acme Foundry Co. The work of Mr. Moore, especially in connection with the use of special alloy gray iron castings, has been of great service to the industry and has placed him in high regard among foundrymen in the Detroit territory.

F. HUGHES MOYER has been elected vice president and senior engineering officer of the Mackintosh-Hemphill Co., Pittsburgh. He formerly was chief engineer successively of the Gary, Ind. plant of the Illinois Steel Co., the Johnston, Pa. plant of the Bethlehem Co., and the Clairton plant of the Carnegie Steel Co.

CLEMENT J. FREUND, manager personnel, apprenticeship and education, Falk Corp., Milwaukee, has resigned to accept appointment as dean of the college of engineering, University of Detroit. Mr. Freund graduated from Champion college with a Bachelor of Arts degree in 1916 and entered the college of Engineering, Marquette university, Milwaukee, in 1917. The same year he enlisted in the army and was commissioned a second lieutenant.

At the end of the war he re-entered Marquette university in the co-operative engineering course and received a degree in Mechanical Engineering in 1922. He then entered the employ of the Falk Corp., and served as chain man, time keeper and heat pourer in the foundry. Later he was made labor foreman in the yard and in the foundry; in 1924 he was assigned to the apprentice department and 1925 he was made apprentice supervisor.

Mr. Freund has been one of the leaders in the apprentice training movement of the American Foundrymen's association, has served as chairman of the committee on apprentice training and now is chairman of the subcommittee on apprentice training of the program and papers committee. He also has written numerous articles for THE FOUNDRY and other magazines dealing with various phases of apprentice training work.

JAMES M. DILL, for the past 12 years manager of steel castings sales of the Erie Forge Co., Erie, Pa., has resigned to become manager of sales Erie Bolt & Nut Co.

CHARLES J. GROS, identified with the brass foundry industry in the Philadelphia district for the past twenty years, has been made sales manager of the Barry Bronze Bearing Co., Camden, N. J. That company, which in the past has been devoted exclusively to development of special bearing alloys, in the future also will produce aluminum brass, bronze, and copper castings.

RALPH G. ROGERS, formerly foundry superintendent, Oakland Motor Car Co., Pontiac, Mich., has been made foundry manager, Buick Motor Co., Flint, Mich.,

Ralph G. Rogers

succeeding Harry Goldstein. Mr. Rogers was born in Shelby, O., Sept. 18, 1896, and was graduated from Ohio State university with a Bachelor of Arts degree. From 1919 to 1921 he was connected with the engineering department, National Cash Register Co., Dayton, O. For the next 10 years he was an engineer with the Delco-Remy Co., and in 1931 was appointed foundry superintendent, Oakland Motor Car Co.

P. H. DESROSIERS is general manager of the Sorel Steel Foundries Ltd., Sorel, Que., recently organized as the successor to Beauchemin & Fils, affiliated with Consolidated Marine Companies Ltd. Mr. Desrosiers formerly was with the original Joliette Steel Foundry for a number of years. He reorganized the present firm of that name in 1925 and continued as managing director until 1931.

J. A. CRITCHLEY, sales engineer of the Sorel company, formerly was with

C. N. R., Dominion Engineering. For the past 8 years he has been in the production engineering and sales staffs of Joliette Steel Ltd.

E. G. JONES, general superintendent, formerly was with the Canadian Brake Shoe & Foundry Co. Ltd. and recently was superintendent Joliette Steel.

D. E. REID JR., field metallurgist formerly was connected with the U. S. Steel Corp., Gary, Ind., and the Colorado Fuel & Iron Co., Pueblo, Colo. as metallurgist.

W. FRANCOEUR, metallurgist, Sorel company, spent several years with Canadian Steel Foundries Ltd., Montreal, and for 9 years was metallurgist and practical steel maker with Joliette Steel.

L. P. TREMBLAY, sales representative, was connected for many years with Beauchemin & Fils in various capacities and recently was in charge of sales.

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H. A. MARTI, one of the organizers of the Maumee Malleable Castings Co., Toledo, has been appointed general manager, succeeding LAMOTTE P. HENRY, recently resigned.

^ ^

MAX W. BABB recently was elected president, Allis Chalmers Mfg. Co., Milwaukee, succeeding OTTO H. FALK who becomes chairman of the board. W. A. THOMPSON, formerly comptroller, and WILLIAM WATSON, general works manager, were elected vice presidents.

^ ^

WILLIAM M. MARR, Ohio Brass Co., Mansfield, has been elected chairman of the foundries group for the all-Ohio Safety congress to be held in 1933. Fred G. Bennett, Buckeye Steel Casting Co., is vice chairman.

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FREDERICK J. FAY has been made foundry superintendent of the Poughkeepsie Foundry & Machine Co., Poughkeepsie, N. Y.

^ ^

GEORGE H. WEILER, formerly secretary-manager, Forging Manufacturers association, has joined the sales department of the Standard Steel Works Co., Burnham, Pa.

^ ^

HAMILTON GARNSEY JR. has been appointed works manager, Goulds Pumps, Inc., Seneca Falls, N. Y. Mr. Garnsey joined the Goulds organization following his graduation from Cornell university, Ithica, N. Y. in 1923.

^ ^

EDWARD B. ASHWORTH, Bethelehem Ship Building Corp., Quincy, Mass., recently was elected chairman of the Boston chapter, American Society for Steel Treatings. Other officers include the following. Vice chairman, E. L. BATHOLOMEW, metallurgist, United Shoe Machinery Corp., Beverly, Mass.; secretary-treasurer, HOWARD E. HANDY, metallurgist, Saco-Lowell Shops, Biddeford, Me.; and chairman of program committee, FREDERICK P. FLAGG, chemist and metallurgist, Waltham Watch Co., Waltham, Mass.

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B. S. STEPHENSON, chairman of the purchasing agents' committee of the American Radiator & Standard Sanitary Corp., New York, has been named vice president. He will continue in his capacity dealing with purchases and raw materials for the company.

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C. J. MORRETTE, for 12 years superintendent of patterns and inspection, Toledo Steel Castings Co., Toledo, O., now is operating a pattern and model making establishment, the Acme Pattern & Engineering Co., Sylvania Ave., and Terminal railroad, Toledo, O.

^ ^

GERARD SWOPE, president, General Electric Co., Schenectady, N. Y., recently was presented the gold medal of the National Academy of Social Sciences in recognition of his constructive social services, particularly his contribution to Greenwich house which is celebrating its thirtieth anniversary and to his plans for dealing with unemployment.

^ ^

L. C. WILSON, formerly plant manager, has been appointed general manager, Reading Steel Casting Co., Reading, Pa. Previous to his connection with the Reading company, Mr. Wilson served as assistant plant manager, American Chain Co., Inc., York division, York, Pa., vice president, Federal Malleable Co., Milwaukee, and assistant to the president, Interstate Iron & Steel Co., Chicago.

^ ^

F. K. NEATH, for the past 8 years connected with the British Cast Iron Research association, has resigned his position to join the Keighley Laboratories Ltd., Keighley, Yorkshire England. Mr. Neath is well known as the honorary secretary of the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen, and was responsible for the organization of the last annual conference of the institute.

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CARL V. DODGE, manager of roll and steel casting sales, United Engineering & Foundry Co., Pittsburgh, has been elected vice president of the company. He has been identified with roll and steel casting production and sales of the company for 26 years.

Mr. Dodge received a high school education at Rochelle Ill., and in 1904 became a shipping clerk in the chilled roll foundry department, United Engineering & Foundry Co., Vandergrift, Pa. Later he became foreman of the cleaning floor and order clerk. In 1913 he was transferred to the Pittsburgh office as a steel casting and roll salesman. In 1921, with the consolidation of the casting and roll sales departments, he was named assistant manager of sales and a year ago upon the death of William Gardner, vice president, was named manager.

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MARK S. JAMES, has been appointed assistant vice president, Pittsburgh Steel Foundry Corp., Glassport, Pa., specializing in the sale of the company's special alloy steels.

WALTER DEFRIES recently identified with the Wm. B. Pollock Co., Youngstown, O., has joined the Pittsburgh Steel Foundry Corp., in a special sales engineering capacity.

RICHARD ARMSTRONG has been made metallurgist of that company.

French Students Visit Several Foundries

The students of the Ecole Superieure de Fonderie, of Paris, recently made a trip in the northern regions of France visiting a number of mines, iron and steel works and foundries. Among the works visited were: Centrale de Beudry, which operates a modern steel foundry; Societe Metallurgique des Usines de Marquise, where they inspected the gray iron foundry and the steelworks; the foundry of Compagnie Massey-Harris at Marquette, where the students saw the foundry operating under American principles of production work and organization; the tube works of Usines Escaut et Meuse at Anzin, and the works of Usines de Denain Anzin, comprising blast-furnaces, steelworks, foundries, rolling mills, etc.

Speaks on Alloys For Foundry Purposes

Robert C. Good, metallurgical engineer, Electro Metallurgical Sales Corp., New York, was the speaker at the regular monthly meeting of the Philadelphia Foundrymen's association held at the Manufacturers' club, Philadelphia, on May 11. Mr. Good spoke on "Alloys for Foundry Purposes."

Joins Northern Blower

Karl Gross has accepted a position with the Northern Blower Co., Cleveland. Mr. Gross is an authority on lead burning, lead coating and lead casting work. His services will be available through the Northern Blower Co. on this class of work.

ALBANY SAND

CAREFULLY GRADED LABORATORY TESTED

A reputation can never be built on occasional quality. One standard—and a high one—*All The Time*—is the one foundation for a reputation.

Dependable!

"We believe that prompt and careful attention to business already secured will scatter its own seed"

Albany Sand & Supply Co.

Albany, N. Y.

Producer and Shipper of the World's Best Molding Sand

Reader's Comment

Interesting communications from readers of The Foundry

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Commends Detroit Convention News

TO THE EDITORS:

I did not find an opportunity to look through the post convention issue of THE FOUNDRY until Saturday and then did not have time to write congratulating the publishers on the splendid appearance of it and the editorial staff on its contents. I desire to express my particular appreciation for the report of the Detroit convention.

I sincerely hope that the new era of THE FOUNDRY, marked by establishing it as a monthly publication, will make it recognized more than ever before as the outstanding leading publication of the foundry industry the world over.

Congratulations to all and best wishes for the success of the new FOUNDRY.

C. E. HOYT

Executive Secretary,
American Foundrymen's Association
Chicago

Right Turn

TO THE EDITORS:

I have read with much interest the last issue of THE FOUNDRY. The new type of paper and the many interesting articles now appearing regularly are steps in the right direction for a bigger and better magazine; and should prove attractive and very helpful to its readers.

J. F. GAFFNEY

Bethlehem Steel Co.
Chicago, Ill.

Extravagance

TO THE EDITORS:

The masterful address of S. Wells Utley, delivered at the American Foundrymen's association convention, reflects without doubt, the thoughts of all serious minded people of this country. The unthinking and, it may be well said the unthinkable, attitude of our taxing authorities bids fair to place our country in bankruptcy.

At this time of vanishing income for every class of our population hardly a voice is raised by our representatives advocating decreases in public expenditures. It seems unnecessary to direct attention to the efforts of private enterprise to balance their budgets. Few of us are able to even approach such a balance. But none will deny that every branch of human activity outside of government is reducing expenditures at every possible point.

While private enterprise is reducing wages and salaries and eliminating waste, our taxing agencies are leaving no stone unturned in their endeavor to increase taxes already in force. The multiplicity of taxes is being augmented, both direct and indirect. Our constitutional right to freedom from confiscation of our homes, factories and even private effects has been so abridged that loss of our property is eventually inevitable.

All of the efforts of our forefathers to insure us against the effects of taxation without representation have apparently been lost during the last 20 years. Protests of individuals and civic organizations such as chambers of commerce fall upon deaf ears. Human endeavor needs but be successful to be penalized for all and more than the traffic will bear. It is the attitude of the Louis' of France, the result of which is history.

To the writer, perhaps the most discouraging aspect of this orgy of governmental extravagance is the fact that the people seem to be relinquishing their rights with but little effort to retain them. Our public servants ignore the mandates of the people who elect and support them. It seems only necessary for the people to express a desire for economy, to have such a desire ignored. We must needs appoint commissions and bureaus to consider questions requiring prompt action. Long after the time when a decision would be helpful, the commission may submit an ambiguous report.

The time for procrastination is past, if we do not wish to enter upon a long period of decadence. Mr. Utley has brought this point out with telling force. His suggested remedy is VOTES. They are supposed to be the effective weapons of a democracy. But we have only two major parties furnishing candidates for whom we may vote. The tremendous extravagance which is bringing us to our knees is common to both the parties.

In all great emergencies the necessity for prompt and direct action has sooner or later become apparent. That this "Government of the people, by the people, and for the people should not perish from the earth," a great and devastating war was fought. History seems to teach us that in the last analysis human liberty can only be preserved by eternal vigilance.

If a resort to the power of the ballots proves ineffective in the coming election, are we lost as a self governing people, or is there still remaining a method by which we as a nation and as individuals may preserve our rights to life, liberty and the pursuit of happiness?

W. E. PAULSON,

Thos. Paulson & Son, Inc.,
Brooklyn, N. Y.

Worldwide Interest

TO THE EDITORS:

Congratulations on the new FOUNDRY magazine. I just received the Pre-Convention issue and find it interesting from cover to cover. The reading material and advertisements are very well arranged and the cuts show up exceptionally well. I feel sure that this new Foundry magazine will be of interest to foundrymen all over the world.

R. F. RINGLE

Herman Pneumatic Machine Co.
Zelienople, Pa.

Double the Value

TO THE EDITORS:

I should like to say a few good words in favor of your policy of using coated paper stock in THE FOUNDRY. In my humble opinion it doubles the value of the editorials and advertisements. I wish you every success, and I hope that your lead will be followed by other papers.

JULIUS S. HOLL

Link-Belt Co.
Chicago

Apprentices

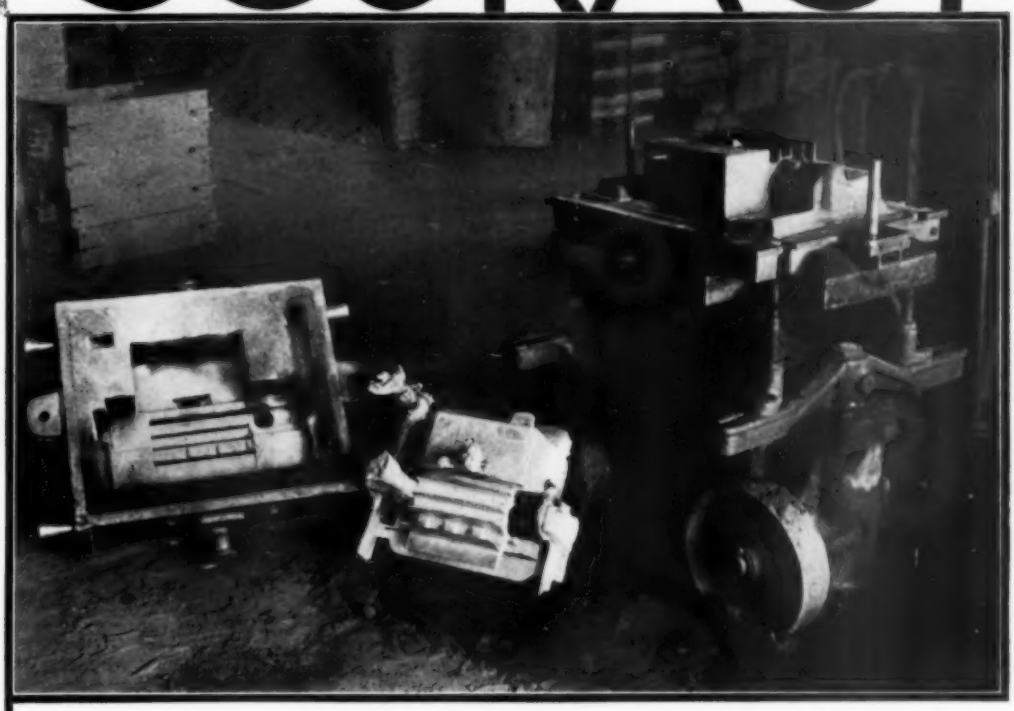
TO THE EDITORS:

The average apprentice, who is given a course of study along with the practical training, is by no means inspired to expect a higher position than molder, unless the one in charge paints a picture so rosy that the boy entering the shop feels himself a highly cultured person at the completion of his apprenticeship. A course of study properly suited to shop use will do much to give the apprentice an insight in his work.

Apprentices taught from books as well as through practice have more initiative and are more flexible and

(*Concluded on page* 42)

ACCURACY



WHEN accurate pattern draw is required, the Osborn No. 559 Jolt Stripper Moulding Machine can be depended upon. The machine illustrated above is in operation at the National Bronze & Aluminum Foundry Company, Cleveland, Ohio.

In addition to accuracy, another outstanding feature of this machine is its quick adaptability to a large variety of patterns. The lifting pins are easily adjustable for both length and width of a wide range of flask sizes in either square, round or long and narrow shapes.

The Osborn No. 559 Jolt Stripper is one of many types of moulding machines in the complete Osborn line. It is the job of Osborn engineers to help you select the correct type of moulding machine to speed your production and cut your costs.

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Consejo de Ciento, 318

OSAKA, JAPAN
Horne Company, Limited
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MILAN, ITALY
S. A. Ing. Ercole Vaghi
Via Parini 14

CALCUTTA, INDIA
Machine Tools, (India) Ltd.

(*Concluded from page* 40)
dependable than those with no book instructions.

I have worked on the floor with an apprentice serving his time and I have been apprentice training foreman in a large shop that was running the training department as a separate unit. Also, I well remember the old method in which I served my apprenticeship. For these reasons I feel that I can speak with knowledge on the subject of training apprentices. The old can't always live.

So keep up the good work, more and better foundrymen.

ERNEST WALKER

Groton, Conn.

Comments Concur

TO THE EDITORS:

Incidentally this issue has been called to my attention with some very flattering comments on the general makeup. I personally concur in this and wish to offer my congratulations and best wishes for the further success of your worthy publication.

E. J. BOTHWELL

International Nickel Co., Inc.
New York, N. Y.

Attractive Reading

TO THE EDITORS:

I wish to compliment you on the improved appearance of THE FOUNDRY. The arrangement is improved and it is altogether more atractive reading.

R. J. TEETOR

Cadillac Malleable Iron Co.
Cadillac, Mich.

From Alabama

TO THE EDITORS:

Allow me to congratulate you on your preconvention issue. I will miss the convention but know I will get a complete report in the next issue of THE FOUNDRY.

C. D. HOLLINS

Gulf-Haven
Josephine, Ala.

Surprise Package

TO THE EDITORS:

I appreciated the copy of the April issue of THE FOUNDRY that you sent to me recently and it would be difficult to express to you the surprise I experienced when I opened the package and saw the new FOUNDRY magazine. This is a dandy job—more interesting I think in its makeup than it ever has been and I found myself going through it more thoroughly than I have in a great many years. More power to you! I hope it works out even more successfully than you have anticipated and only wish we could dress up steel castings in a somewhat similar manner and do a successful job.

L. S. PEREGOY

Sivyer Steel Casting Co.
Milwaukee, Wis.

Set New Ideal

TO THE EDITORS:

Accept my congratulations and best wishes over the recent issue of THE FOUNDRY, with its numerous improvements and attractive features. You have set up a new ideal of trade paper accomplishment that I am afraid will be hard to maintain, except for your own great ability and resourcefulness.

O. L. JONES

Illinois Clay Products Co.
Joliet, Ill.

Subject Well Handled

TO THE EDITORS:

I just finished reading with a great deal of interest, the latest number of THE FOUNDRY magazine. You are to be complimented upon the change in the appearance of this publication. The subject matter is certainly handled in a very interesting manner and I am inclined to think I will give more time to the reading of this magazine in the future than I have in the past.

C. S. ANDERSON

Belle City Malleable Iron Co.
Racine, Wis.

Elect Officers of Quad City Association

Charles F. Scherer, Davenport Machine & Foundry Co., Davenport, Ia., was elected president, Quad City Foundrymen's association at the regular meeting held at the LeClaire hotel, Moline, Ill., Monday, May 16. Other officers are as follows: Vice president Harry F. Henninger Sr., Farmall Works, International Harvester Co., Rock Island, Ill.; secretary and treasurer, Bruce Koepp, Davenport Machine & Foundry Co., Davenport, Ia.; directors, P. T. Bancroft, H. Bornstein, R. L. Eichman, A. E. Hageboeck, F. W. Kirby, A. D. Matheson, J. H. Ploehn, John Diedrich, E. A. Gullberg.

W. J. McNeill, superintendent, Federal Malleable Co., West Allis, Wis., addressed the meeting on "Scientific Piece Rate Setting in the Foundry." Mr. McNeill explained in detail the point system which he has developed for use in his foundry. Hyman Bornstein, P. T. Bancroft, Horace Deane, Garnet Phillips and A. E. Hageboeck reported on the Detroit convention of the A.F.A.

John Ploehn, superintendent, French & Hecht Inc., Davenport, presented an interesting talk on "Taxation."

Apply Standard Costs to Budget Control

J. Sabin, Walker Mfg. Co., Racine, Wis., was the principal speaker at the regular meeting of the Malleable club held in the Blatz hotel, Milwaukee, May 7 with Scott Mackay, University of Wisconsin, presiding. Mr. Sabin explained the method of using standard costs in connection with budget control of foundry operation. He indicated how it was possible to break up excess cost over standard allowance into two factors, one chargeable to plant supervision and the other chargeable to decreased volume of production.

D. I. Dodson, metallurgist, Glancy Malleable Co., Waukesha, Wis., gave an interesting summary of current literature of interest to malleable foundrymen. Charles Hintz, superintendent, Badger Malleable & Mfg. Co., South Milwaukee, Wis., led the discussion of estimates made from blueprints furnished by his company.

Book Review

Selected A.S.T.M. Standards for Students, 1931; paper, 172 pages, 6 x 9 inches, published by the American society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $0.50 plus postage and in Europe by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster, London.

Specifications and methods of test of the American Society for Testing Materials have been selected for this publication on the basis of their value to students in the study of materials of engineering. As pointed out by the society, the work is not intended to replace text books for courses in testing materials, but to supplement them. Information is included for both metallic and nonmetallic materials.

Methods of test include standard procedure for verification of testing machines; methods of tension testing of metallic materials; methods of compression testing of metallic materials; and methods of brinell hardness testing of metallic materials.

Specifications for ferrous metals cover gray iron castings; arbitration test bar and tension test specimen for cast iron; steel castings; malleable castings; wrought iron bars; steel for bridges; structural silicon steel, etc. Nonferrous suecifications cover soft or annealed copper wire and naval brass rods for structural purposes.

Herman H. Lind, consultant for industrial and commercial enterprises and for the past 2 years general manager, Malleable Iron Research institute, has removed his office to 805 Cuyahoga building, Cleveland.

Sterling Flasks

More than 70 per cent of all foundries use Sterling—the only *rolled* steel flask—the only flask with the *solid center rib*—the only flask with the *angle reinforcement.*

Sterlings *can't burn—can't break*—are *lighter* and *produce more work.*

With all this before you—why use any flask but Sterling? Try out a few—you'll soon notice the difference.

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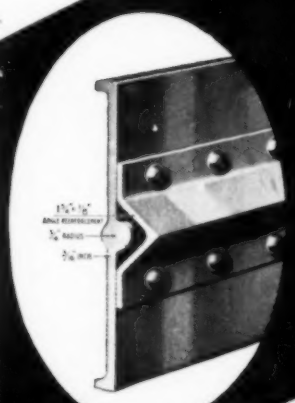

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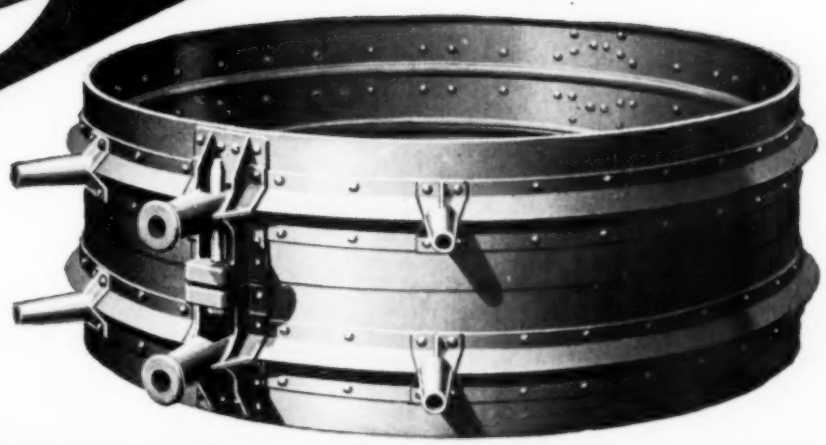

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Sterling *rolled* steel Flasks are suitable for either bench, floor or machine moulding.

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Prevent Losses with

Proper Gates and Risers

By PAT DWYER

THE crankpin bushing on solid end type locomotive side rods, shown at *A*, *B* and *C*, Fig. 160, is a simple casting that usually causes no trouble when molded in green sand. It may be gated according to either of the methods shown, but a slight shrinkage probably will show on the top with gate *B* and to a lesser degree with gate *C*. Where sand is not particularly adapted to the job, the molder may find it advisable to mold the bushing flange down and pour metal through two gates, one at the top and the other at the bottom.

Should Use Facing

Fine close sand is not suitable for molding castings of that character. If no other sand is available the pattern should be faced with a mixture of half and half new and old sand containing one part flour to 20 parts sand. The choice is not limited to flour as practically any core binder may be employed.

Defective castings may be due to cold metal, to the character of the sand, the molding method, the ramming or venting. If the metal flows readily through a small sprue, the defect is not caused by low temperature. Reference has been made elsewhere to unsatisfactory sand and molding methods.

Ferrules and other thin castings of the bushing type are gated on top as shown at *D* Fig. 160. Usually a brass pattern with the gate attached permanently is employed where the castings are molded by hand. However, these castings in the majority of instances are made in large quantities on a production basis and the patterns and gates are mounted on machine pattern plates.

Under certain conditions, ferrules have been molded and cast horizontally four in a flask in the manner illustrated in the lower part of Fig. 161. The cores are dry sand. Flasks are provided with rectangular openings for gates at each side. The mold is made in the usual manner, but after it is closed it is clamped and set up on edge. A pouring gang fills the gates in a long row of molds. After the crucible passes, a second crew inverts the molds. On the way back, metal is poured into the second set of gates.

Presents Sand Data

Dry sand cores were employed almost exclusively in ferrules before aluminum was introduced in yellow brass practice. The metal was not hot or fluid enough to run the castings made in green sand molds where the cores also were green sand. With the advent of aluminum as an addition to brass mixtures the fluidity has been increased and as a result practically all ferrules now are molded entirely in green sand. Two ounces of aluminum will work wonders in a 100-pound pot of yellow brass, high in lead and zinc.

While on the subject of sand, the following data will prove of interest to readers who are in a position to apply sand testing and control ap-

Use Proper Sand

A PROPER grade of sand is one of the most essential factors in the production of nonferrous—or any other kind of—castings. This is particularly true with molds and cores forming bushing castings. The core is surrounded entirely with molten metal and for that reason it is highly important that the gas should escape readily through the proper channels provided for the purpose. If a hard or an ill vented core forces some of the gas to attempt a passage through the metal, the action will set up a disturbance which will be reflected later in a dirty and honeycombed casting. Green sand is safe in the hands of skilled molders, but dry sand, especially for the cores, offers an insurance against many of the common defects found in bushings and similar castings.

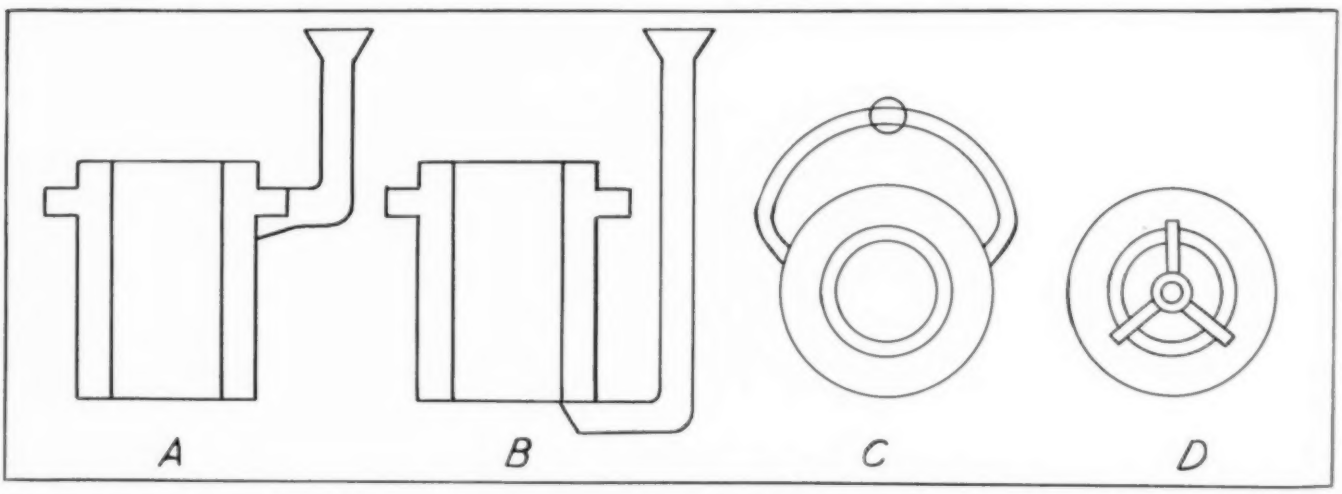

Fig. 160—Fairly heavy flanged bushings may be gated satisfactorily in any of the three places shown at A, B and C. Light, thin bushings preferably are gated as at D

paratus as recommended by the American Foundrymen's association. The extract is taken from a paper entitled "Foundry Sand Control," prepared by the late A. A. Grubb at the instance of the American Foundrymen's association for presentation before the Dutch Foundry association in the fall of 1931. In a table covering average test data on heap sands used for various types of castings it was found that the sand fineness for light to medium brass castings was 218, while for heavy brass it was 108. The bonding substance on the first was 13 per cent and on the second, 12 per cent. The moisture content was respectively 8 and 7.3 per cent. Permeability on the light brass sand was 17 and on the sand for the heavy castings 51. In the green bond strength, the tensile strength of the light brass sand was 6 and the compression was 4. On the sand for the heavy castings these figures were 5 and 4. Widest variation is found in the fineness numbers and in the numbers indicating the permeability.

Parted at the Bottom

In many instances the type of bushing shown in the upper part of Fig. 161 is designed to leave its own green sand core. On account of the central horizontal flange on the outside the mold must be parted at the bottom, at the center and at the top. Where many castings are required, a metal pattern is provided, but usually a wood pattern must serve for one or two castings. This fragile wood pattern built up from narrow wood segments will not withstand rough usage and the glued joints will start if the pattern is left in the sand for any length of time, for example, over night.

Alternative and usual methods of gating are shown at *A* and *B*. In example *A* the metal enters the mold at the bottom and at the central flange. In example *B* all the metal enters the mold at the bottom. The riser at the top is optional. Outside of serving as a gage to show that the mold is filled, it is of no value. The general uselessness of risers was covered in Parts 2, 3, 10 and 11 of the present series.

Alternative methods of molding a somewhat similar casting are shown in Fig. 162. The mold and core at the left are green sand. The mold is formed in a vertical position and the pattern leaves its own core. The mold at the right is made horizontally from a solid pattern split through the center. The inside of the mold is formed by a dry sand core. After the core is placed in position, the mold is closed and then turned up on end so that the casting may be poured in a vertical position.

In some instances the pouring basin and riser can be made up as part of the mold while still in a horizontal position. In others they are built up on top of the mold after the mold has been upended. In the second instance great care is required to prevent loose sand from falling into the mold.

In the illustration to the left in Fig. 162 the metal enters the bottom of the mold through a number of wide flat gates connected to a circular runner fed from a long sprue extending from the runner to the top of the cope. In the illustration at the right the gates are formed in the core print part either of the mold or the core.

For molds of that general character, a sprue 1-inch in diameter is large enough. With a larger sprue the metal is not confined in a compact stream

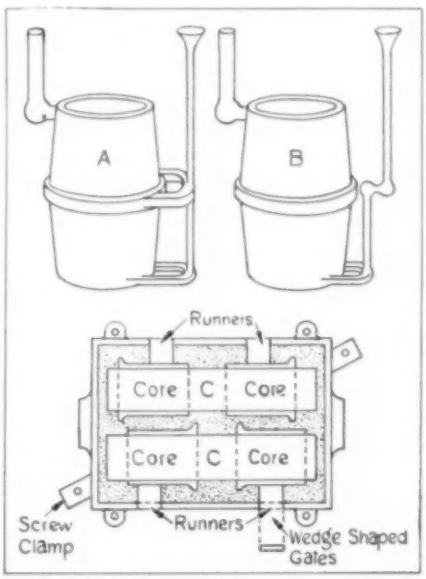

Fig. 161—Ferrules are cast vertically as at A and B and sometimes horizontally as at C

falling through a protective sheath or film of metal. Unless the sand is extremely open and at the same time tenacious, it will cut and wash before a small stream in a large sprue. An examination of the metal sprue, rough and ragged, frequently will explain the presence of mysterious dirty areas in the casting.

Temperature of the metal will vary to some extent, depending on the character of the casting, but in all instances the metal should be poured *hot*. If the sprue chokes before the mold is filled it may be taken as evidence that the metal is too cold, and *not* as an indication that the sprue is too small.

Importance of adequately venting bushing cores—green or dry sand—cannot be stressed too strongly. The dry sand core shown to the right in Fig. 162 is little more than a shell. Manner of venting the green sand core is shown at the left of the same illustration. A gate stick extending from the bottom of the core to the top of the cope may be employed to form a continuous passage for the escape of the gas. In smaller size molds the opening is made with a sprue cutter. The central opening is supplemented by a ring of vent holes close to the face of the core. These are formed with a vent wire. Shallow channels scratched in the joint connect the tops of the small vent holes with the large vent hole in the center.

Under ideal conditions, suitable sand closely controlled, expert molders and satisfactorily melted metal, the output of bushings in which the pattern leaves its own core, will not equal the output per man where dry sand cores are employed. In addition, the rejection of castings in the machine shop will be greater. Dry sand cores—properly made and vented—carry an insurance value which must be reckoned when comparing their cost with cores made of green sand.

Risers Often Unnecessary

Reference was made a few paragraphs back to the general uselessness of risers. This must not be construed as meaning that all risers are useless. Specifically it referred to risers that are put on for no definite purpose. Risers that are put on through habit and custom. It always has been done, therefore it must be continued. In many instances the excuse is that the riser shows when the mold is filled. That excuse is admissible for beginners, but experienced operators do not need this indicator.

Occasional instances arise where a show-up or a flow-off riser is desirable, but in the great majority of instances, risers of this kind are unnecessary.

However, some castings shrink in a manner that requires addition of extra metal. Risers are placed on these castings to serve as reservoirs from which the metal sinks by gravity to compensate for the shrinkage of the casting. Manifestly if the metal freezes in the riser before it sets in the casting, the riser has failed in its purpose. This is what happens when the riser is too small. The metal in the casting sinks or drains away and the result is a large cavity or a collection of smaller cavities immediately below the neck of the riser.

To overcome trouble of that kind the cubic capacity of the riser is increased. Labor involved in removing large risers causes the brass foundryman to hesitate in placing them on his castings. A visit to a steel foundry, an examination of the risers and the removal methods employed, usually give him a new viewpoint in that respect. Cost involved in placing and removing a large riser is not equal to the cost of replacing the casting.

Nonferrous foundrymen are divided in opinion into two main groups. One holds that castings shrink to a greater degree when poured with hot metal, while the second holds to the opposite view, that is that cold metal results in greater shrinkage. In the Sept. 15, 1924 issue of THE FOUNDRY,

Charles Vickers delivered an opinion on this point as follows:

When a metal is heated the cohesive attraction between the molecules is diminished, the force of repulsion is strengthened and when the two forces become equal, the metal is a liquid. If the heating is continued, the metal ultimately will become a gas, with the force of cohesion lessened or destroyed entirely. The force of repulsion operates to drive the molecules further apart. The metal is expanded greatly at this latter stage and it follows that the higher the temperature the greater the expansion.

No doubt it is possible to pour metal too hot into molds, but it also is possible to pour it too cold. The metal must be sufficiently hot to be completely fluid. If the metal contains zinc it must be hot enough to volatilize a certain amount to envelope the falling stream, thus excluding the atmosphere and preventing oxidation. Otherwise the casting will contain oxide films and will leak under slight pressure.

Cold metal does not give either a high head or a riser time to function properly in the prevention of shrinkage. Test this with an ordinary locomotive rod brass, cast face down and with all the mold in the cope. Use a high head, a sprue to the joint and a gate into each flange. One of these castings poured with cold metal will show a shrinkage crack on the back at the junction with the flange. The casting poured with hot metal will not show this defect, assuming, of course, that nothing is wrong with either mold or metal.

A shrinkage or *draw* at the point where the gate joins the casting, is a common form of defect on chunky yellow brass castings. A little manipulation of the gate and runner usually is sufficient to prevent a recurrence of that form of trouble. In some instances it is only necessary to raise the pouring head a few inches. In others, changing the runner from the drag to the cope will effect a remedy. In a comparatively few instances a shrink bob or small blind riser above the gate close to the junction with the casting, is all that is required to prevent a *draw* at this point.

A foundryman sometimes is puzzled to account for worm holes in castings made from scrap brass. Some of the castings are sound while others poured from the same pot show this defective area in the vicinity of the gate. A moment's reflection will convince any person that where perfect and imperfect castings are poured from the same pot of metal, the metal in itself is not at fault. Metal that is gassed in the furnace is gassed all through and will show up in every casting that is poured. Obviously the cause of the defective castings must be sought in the sand or in the molding method.

Local Disturbance

The fact that the holes are found in the vicinity of the gate indicates that they are due to a local disturbance at that point. Investigation probably will show that the molder is overly prodigal with the swab. The swab has a legitimate place in the molder's kit of tools but it is a dangerous instrument in the hands of a careless or thoughtless man. Its use enables the man to manipulate his sand to better advantage and he cheerfully closes his eyes to what will take place later when this soggy section of sand is covered with molten metal.

The ideal mold is one that requires neither swabbing, patching or any other manipulation. However, ideal molds constitute the exception rather than the rule, particularly on odd jobs and in small numbers. A swab or some other device must be employed to dampen the sand at certain places. Danger of blowholes, cuts, scabs and washes may be avoided by substituting kerosene oil for water. Most of the oil will have evaporated before the mold is poured and the remainder seems to have a favorable effect on the action of the metal. As an additional precaution when using remelted scrap, it may be advisable to treat each 100 pounds of metal with 1½ ounces of phosphor copper.

Instances occasionally arise particularly where a casting differs to a considerable extent to those usually produced in any given foundry where a foundryman is inclined to wonder if an acetylene torch can be utilized for removing large gates and risers on blank gears.

If the risers are cut into the rim of the wheel, they can be knocked off while the casting is hot. A slight fillet at the junction will prevent the riser from *breaking in* to the face of the casting. Where the risers are placed on top of the casting, a certain amount of danger accompanies any attempt to break them off while hot. It is safer to wait until they are cold, when they can be sawed off or cut off.

So far as affecting the metal is concerned, the acetylene torch may be employed freely for cutting risers on nonferrous castings. However, the operation of the tool requires a certain degree of knowledge and skill and should not be entrusted to every Tom, Dick and Harry. The acetylene torch is used in large plants for cutting bronze sheets and scrap castings to a size suitable for melting.

This is the thirtieth of a series of articles dealing with the various types of gates and risers in the foundry industry. The thirty-first installment will appear in an early issue.

THE EDITORS.

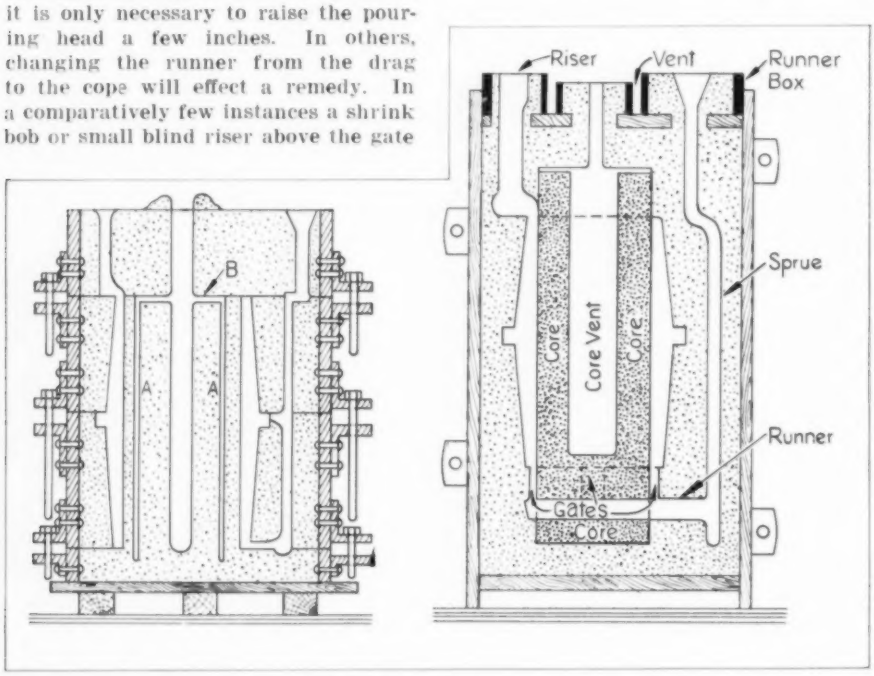

Fig. 162—Irrespective of the type of gate employed, a large central core vent is an important feature in casting bushings

Deoxidize Copper with Calcium and Zinc

In a study of metallic deoxidizers for copper, E. E. Schumacher and W. C. Ellis in a paper presented at the April meeting of the American Electrochemical society, found that up to 0.2 per cent calcium addition, each 0.05 per cent remaining in the copper reduces the conductivity approximately 1 per cent. In zinc additions up to 0.3 per cent, each 0.05 per cent remaining in the copper lowered the conductivity about 0.8 per cent.

Beryllium reduces conductivity rapidly as with additions up to 0.1 per cent, each 0.05 per cent of residual beryllium retained in the metal reduces the conductivity approximately 10 per cent. Barium and strontium have little tendency to alloy with copper, and consequently decrease conductivity slightly. Lithium also is a good deoxidizer, but is exceedingly reactive with the oxides in refractories. However, it is doubtful whether the latter three elements can be used commercially due to their high cost.

GLUTRIN *and* GOULAC

The Leading Core Binders

It is only natural for foundrymen to standardize on core binders that will give them the best results with the least effort and expense.

Judging by the list of core binder users that have ordered Goulac and Glutrin for years these products *must* do all that we claim for them—they *must* contribute *more satisfactory* and *economical* casting results.

GOULAC—*first among dry binders*

GOULAC is a soluble core sand binder in powdered form, air floated, mixes with sand readily and has great binding strength.

The core cleans from a casting as easily as an oil core and is absolutely smokeless at the oven and mold. Goulac can also be used on a chill and for spraying cores, for making paste, for a tempering element for dry sand facing and for a tempering element for green sand facings.

GLUTRIN—*first among liquid binders*

GLUTRIN is a liquid core binder, and because it is a liquid insures an even mix in the sand and consequently uniform strength.

Is not affected by heat or cold and will not deteriorate.

Can be used in combination with core oils, compounds and flour—also for spraying, and making paste and wet blacking.

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Detroit, Mich.
Holyoke, Mass.
Indianapolis, Ind.
Milwaukee, Wis.
Minneapolis, Minn.
Newark, N. J.
New Haven, Conn.
Philadelphia, Pa.
Pittsburgh, Pa.
Providence, R. I.
St. Louis, Mo.
Worcester, Mass.
Toronto, Ont.
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• • •

CARLOAD SHIPMENTS:
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General Office: 230 Park Avenue, New York City

Operating Plants: Au Sable Forks, N. Y.; Erie, Pa.

*3

Steel Founding in America

(*Concluded from Page* 18)

be inclined to favor the acid electric process as being freer from chance of failure of the human controlling element, and therefore more likely to produce satisfactory material, regularly and consistently.

Obviously this must be the considered opinion of the American steel founders in general, as instanced by the rapid growth of the acid electric process, and the coincident decrease in the use of the converter.

Taken generally, there is no indication that the ultimate quality of the castings produced by acid electric furnaces is superior to well-made open-hearth castings, and the author would consider this only to be expected. The critical reactions of the two processes are practically identical, the only essential difference being the source of heat supply.

The considered American opinion could be taken as represented by an appreciation of the great value of the process for handiness, in that it enables many varied analyses of steel to be produced in the desired small quantities; an ease of control, both mechanical and metallurgical, and the capability of high temperature production enabling thin, small castings to be produced satisfactorily. These characteristics are sufficient fully to justify the standing achieved by the electric furnace.

Reduce Sulphur in Charge

Equipped with a basic lining, unusually low sulphur and phosphorus content can be assured easily, but modern thought in steel castings deprecates an excessive importance being given to abnormally low sulphur and phosphorus as a material indication of casting quality. It is admitted that excess in either or both of these elements is detrimental, but figures of 0.05 to 0.06 of either in the author's experience, never have been proved responsible for shortcomings in behavior of service, or mechanical test properties.

Steel scrap easily can be obtained for use in acid-lined furnaces containing considerably less than these limiting figures, and therefore the refining advantages of the basic furnace become an unnecessary elaboration. Further, the author, and many of his colleagues, with experience of both acid and basic processes, are of opinion that acid electric steel is easier to handle. It appears to possess a fluidity and consequent ability to be handshanked, in excess of steel of equivalent composition from a basic-lined furnace.

It is controversial as to whether this is due to the presence of differing quantities of oxides, remanent in the steel after finishing. However, it is logical to believe that the strongly reducing condition commonly produced in a basic-lined furnace during the final period of the working of the charge, a condition essential to satisfactory desulphurization, should result in a minimum of oxides in the bath of metal.

It is also believed that an intensification of these reducing conditions, or a prolongation of their time period, results in an exaggerated form of sluggishness or lack of fluidity. Whether such explanations are accurate, cannot be said definitely, but the trend toward acid production, where electric steel is needed for thin, small castings, would appear to indicate that general experience confirms the opinions held.

The basic process, due to an enhanced control over slag composition, possesses economic advantages in the case of expensive alloy steel. Such steel can be produced with practically no losses of alloy additions to the slag, and regularity of alloy content thus is assured easily.

The latest entrant to the electric furnace field is the high frequency type furnace, and steel foundries with specialty products of high alloy type, in this country, are already installing them. Metallurgically, the process is one of dead melting, analagous to that of the crucible, but the steel is not subjected to any gaseous atmosphere.

Application of the furnace to general commercial steel castings stands to be economically demonstrated. Initial cost, due to essential electrical apparatus, is high in proportion to melting capacity of the unit. It is stated freely that current consumption per ton of carbon steel produced is little, if any, higher than with the arc type furnace.

Operation of molding might be split in two parts: first, the making of the mold itself; and second, the mechanical contributory appliances associated with the operation.

Every known type of molding machine is in constant use in American foundries. Squeezer machines, or combined jolt squeezer for light work; jolt ramming machines of various types for larger work; and the sand slinging machine, where its use is suitable and economical, are all common everyday occurrences. To the observer versed in foundry operations, all the common molding methods, and the machines used, are similar in America to those now found in other countries.

Serving Equipment Adequately

The principle is appreciated fully that no machine can perform adequately unless all contributory factors are given full attention. It is of little use possessing a machine with a potential molding capacity of so many flasks per hour, and being unable to avail one's self of this, because flasks, sand and other materials cannot be provided to the machine at the necessary rate, or alternatively, finished molds cannot be got away at the necessary speed.

Therefore, it is noticeable that attention of American steel founders has focused itself on mechanical handling, at rates of speed designed to insure co-ordination of supply, operation and clearing time.

Sand is provided, prepared to standards, in the most convenient position to be fed straight to the flask. Adequate supplies of satisfactory flasks are available, and the rammed-up molds, when of suitable type, are removed on conveyors of similar convenient means.

It is obvious that to keep step with such molding conditions, the class of pattern is important. An impression is received that for real production work expense on patterns is not spared, and first-class metal patterns are commonplace.

While referring to molding, there exists what would appear to the European viewpoint a weakness in existing American foundry conditions, in the arrangement to assure a succession of skilled labor. The author is of opinion that founding, being in most of its branches a mixture of art

Aggressiveness

IN pointing out the salient features of American steel founding, Mr. Melmoth has performed an important service for the entire foundry industry of the world. He has shown that the success and expansion of the steel casting industry is due basically to the progressive and aggressive attitude on the part of steel founders of the country and to free and open interchange of technical and business information, rather than to the immensity of demand for steel castings.

This article is abstracted from a paper prepared by Mr. Melmoth as the exchange paper of the American Foundrymen's association to the 1932 meeting of the Australian Bureau of Steel Manufacturers. The author is vice president in charge of operations of the Detroit Steel Casting Co., Detroit.

and science, it will be a long time before the application of mechanical genius can oust completely the necessity for highly trained labor.

It is common in Europe for an adequate number of youthful apprentices to be accepted as a necessary part of the organization of the shop. Education and shop-training of these boys is deemed essential to a continuance of the supply of experienced molders, and they are fostered and carefully supervised with that end in view. In the United States, while it is only fair to admit that the question is receiving increased attention, it can be said with accuracy that the training of youths for foundry employment is not given equal prominence. There will always be a large amount of work calling for such trained skill, and it is difficult to see how craftsmanship can be replaced by mechanical arrangements in these cases.

A controlling influence is undoubtedly the American educational system. Boys leave school at a later age than in Europe, and are given a type of education, which, while it may be admirable, does not encourage a boy to be satisfied with a low rate of pay during an apprenticeship.

The solution of the problem will be assisted by the fact that American foundries are continually becoming more desirable places in which to work, and therefore should represent a greater attraction to boys desiring a career. In the meantime, schemes for training youths are being evolved, with the co-operation of manufacturers, educational institutions, and technical societies, which should insure an adequate supply of skilled labor in the future. The old idea of a foundry being of necessity a dirty place, suitable only to low-grade labor, will need to be removed completely before the average educated American boy will consider a life-long association with it.

This is the first of two articles by Mr. Melmoth on the steel foundry industry of the United States. The second article will appear in an early issue.

THE EDITORS

Equipment Speeds Shakeout

(*Concluded from Page* 19)

Two cast steel guides with the ends of the upright edges flared outward to anticipate slight variation in the position of the flask as shown in Fig. 2, guide the flask into position on the shakeout unit. Through a pivot arrangement, the guides readily may be adapted for handling any size flask between the sizes indicated. The vibrators are adjusted nicely to impart the maximum amount of vibration to the load without straining the equipment.

Molds are made on jolt, rollover, pattern draw machines. There are three pairs of machines, a cope and drag machine in each pair. All cope machines were supplied by the Osborn Mfg. Co., Cleveland. Two of the drag machines were made by the Osborn company and one by Herman Pneumatic Machine Co., Zelienople, Pa. There are only two pair of machines in operation at one time. The third pair is primarily a standby unit.

The Herman machine in the outfit is equipped with a special air operated clamp which holds the mold in position during the rolling operation. The clamp consists of a small air cylinder, a steel shaft threaded at one end and a lug which fits on the shaft. The lug may be adjusted—within reasonable limits—on the threaded shaft. The clamp is attached to the machine platen by a pair of small lugs. The end of the cylinder rests between the lugs and is secured by a bolt and cotter pin. A spring attached to the rear of the mechanism automatically releases the clamp, which falls away from the mold when the pressure is released.

In practice the operator adjusts the clamps in position and then steps on a double action valve in the air line. This clamps the mold tightly to the platen of the machine. He then throws the lever which operates the rollover mechanism. When the mold is rolled over the operator releases the pressure on the clamp valve.

All the valves are connected to an air line where the pressure is 85-90 pounds per square inch. A pressure reducing valve admits air to the clamp cylinder at 40 pounds. In Fig. 3 the air lines to the clamps are shown passing through cast iron bars on the table of the molding machine. In this instance the bars were placed on the machine to raise the flasks and reduce the fatigue of the operators. These bars also shorten the necessary connections. If they were not used the air lines would have to be carried around the machine.

Steel Founders Consider Pooling

(*Concluded from Page* 30)

shows that during the last six months approximately 27 steel foundries in various parts of the country have closed down with no definite time proposed for the resumption of operations. In addition, 10 more have been reported as going out of business.

New members of this society are the Monarch Steel Foundry & Engineering Corp. Ltd., Stockton, Calif., and the Standard Brakeshoe & Foundry Co., Pinebluff, Ark.

Clarence Tolan Jr., Dodge Steel Co., Philadelphia, deplored destructive buying methods which are pursued by some consumers of castings. He pointed out that these buying methods are tantamount to a war on profits and stated that the elimination of profis means eventual bankruptcy. He urged a buying policy which will enable producers to make a profit.

Clarence B. Bartlett, Industrial analist, Milwaukee, and managing engineer on the committee of dust, fumes, vapors and gases of the Wisconsin Manufacturers association spoke about "The Cost of Dust in the Steel Foundry."

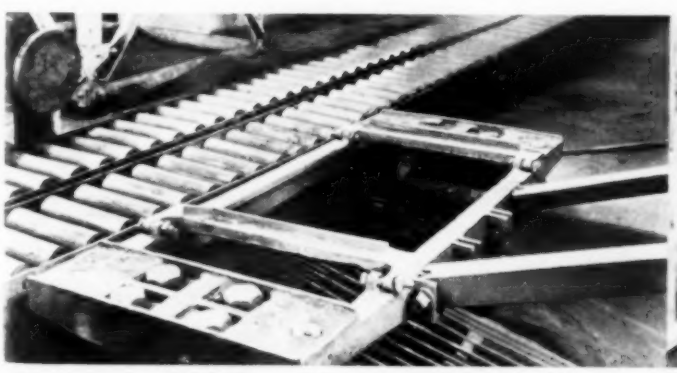


Fig. 2—Cast steel guides control the position of flasks on the shakeout table. Fig. 3—Air lines pass through cast iron bars on the table of the molding machine

Malleable Jobbing Foundry

(*Concluded from Page 27*)

half, is a much more flexible unit, permits delivery of castings demanded urgently and reduces operating cost, particularly in quiet periods.

From 8 to 9 days were consumed in each complete cycle of the former furnace. After the cycle was complete the furnace had to cool down to permit men to withdraw one load and place another. The former method of loading was slow compared to that practiced at present. The fire was not started until after the oven was closed and the door joints daubed with mud. About 36 hours later the furnace was up to the required temperature of 1600 degrees Fahr. It was held at this temperature for 72 hours to insure a proper soaking of all the contents and then was allowed to cool through a period of 96 hours.

In the present installation the sliding counterweighted door is closed immediately after the carload of annealed castings is removed. In this manner a fairly high temperature is retained in the furnace. The car is unloaded, reloaded and shoved back into the furnace in less than an hour. When the door is closed the temperature is above 1000 degrees Fahr. and from this a flame temperature of 1800 degrees may be attained in an hour.

Reduces Soaking Period

The castings are raised to the required temperature of 1600 degrees in 18 hours and held at that temperature for 40 hours instead of the 72-hour soaking period in the former furnace. The flame then is shut off and approximately 24 hours later when the temperature of the castings has dropped below the critical range, 1350 degrees Fahr., the car is pulled out of the furnace and the pots are cooled rapidly. The complete cycle has been reduced to 86 hours compared to 198 hours under former conditions.

The flame enters the furnace at the rear, passes over the loaded pots, then down and around the pots to flues arranged in a row near the bottom of the side walls. Flues in the side walls conduct the spent gasses to a central flue on top leading to the stack. The flame distribution provides a uniform temperature throughout the furnace. In addition to the shorter operating cycle, other advantages are claimed for this installation. The life of the lining is prolonged, heat losses are reduced, fuel is conserved and the high temperature insures complete combustion.

Malleable foundrymen are familiar with the embrittling effect of galvanizing on malleable castings. A process for rendering the castings immune to brittleness was described in the March 15, 1926, issue of THE FOUNDRY. Before the castings are galvanized they are heated up close to the critical temperature and then cooled rapidly in water. It is claimed that the rapid cooling of the castings after they have passed the critical stage and after they have been removed from the new furnace, will affect castings to be galvanized, in the same manner, will render them immune to embrittlement.

The pulverizing and blowing equipment for the annealing furnace was manufactured by the Grindle Fuel Equipment Co., Harvey, Ill. This unit serves the quick annealing furnace shown in the accompanying illustrations and also serves a core oven as may be noted from the second supply pipe shown in Fig. 1.

Use of powdered coal is not new in the Meeker foundry. The main melting furnace has operated on this type of fuel for many years. A larger pulverizing unit also manufactured by the Grindle Fuel Equipment Co. is of slightly different and compact design. An interesting home made attachment is a small bypass from the pipe leading to the burner. This bypass diverts some of the powdered coal to a miniature flour mill type dust arrester, from which the coal dust is taken for use in facing sand mixtures.

Lamont Points To Important Work of American Trade Associations

ROBERT P. LAMONT, secretary of commerce, recently, in connection with his report as chairman of the jury of award at the presentation of the annual award of American Trade Association Executives, pointed to the particularly trying conditions which have confronted the American trade association during the past year. Times of economic distress give rise to intensified competition, according to Mr. Lamont, a competition which makes increasingly difficult that effective co-operation upon which the whole success of trade association activities depends.

The United States is passing through a major crisis economically. As a result the whole principle of business co-operation, upon which trade associations are founded, has been put to a severe test. That the trade association has met this test is amply proved by the record of performance which organized business in the United States has written during the current crisis.

American business, through its trade associations, has demonstrated that co-operation among business groups may replace hostile and destructive competition, while preserving the American principle of individual initiative, individual achievement and individual reward; the keystone of our economic system.

Mr. Lamont believes we are in the midst of a struggle toward a newer and better economic age. We face a future containing all the necessary elements of progress and prosperity. We find evidence of such promise in the wide range of activity which trade associations are covering under a new spirit of leadership which has developed under the pressure of adverse business conditions and which has been demonstrated in the face of a bitter economic struggle.

The American trade association not only has pressed forward along the lines of activity laid down in more prosperous days, but has continued constructive effort in the fields of cost-accounting, scientific marked analysis, standardization and simplification, traffic management, industrial advertising, and other proven fields of activity, said Mr. Lamont. However, beyond all this, it has faced with energy and outstanding courage the new problems which have risen in the wake of the depression; problems that come with unemployment, lowered consuming power, and over-production.

With the vigor and self-reliance that have characterized organized business groups in America throughout our history, many trade associations have attacked those problems, meeting the many legal complications which they entailed, and working in a spirit of co-operation with government agencies.

Secretary Lamont stated the struggle is still on. On every side are the perils of over-production, wasteful distribution, unstable employment and fluctuating profits. Complete victory lies in the future, in the courage and vigor of the individual business unit and its ability to co-operate with others in meeting common problems. The individual cannot win in a struggle with over-production, under-consumption and unemployment. Only organized co-operation can conquer. With the trade association rests the responsibility for leadership in these trying times.

Include more scrap in your charges!

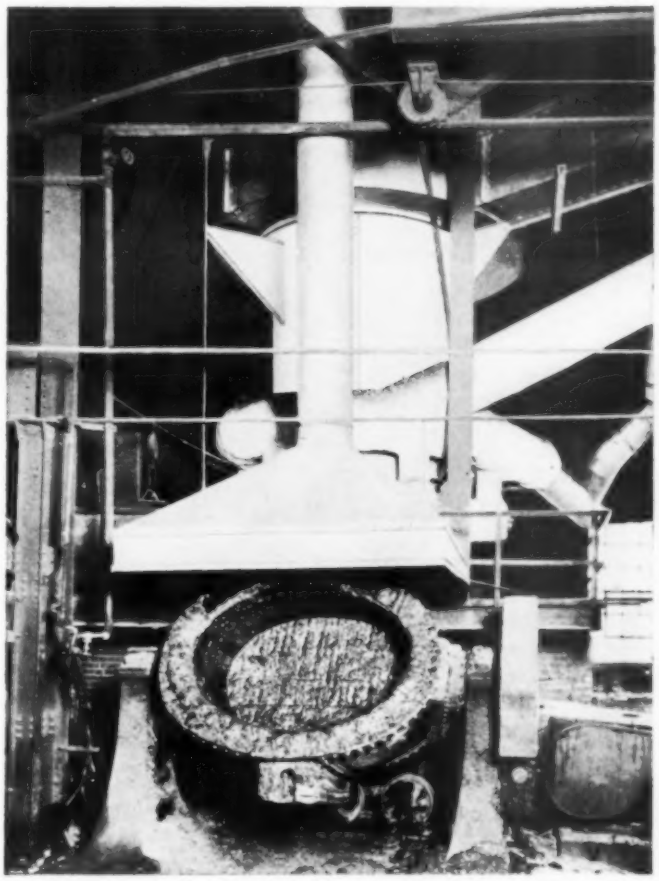
Do this safely and with big savings by equipping your cupola for the Griffin Hot-Blast Process

REGARDLESS of varying market prices, the net cost of iron from scrap is always very substantially less, and the necessary elements, silicon and manganese, are just as good when taken from scrap as from pig. Evaluation on this worth basis, the only logical one, demands utilization of scrap *right up to the safe limit* if greatest per-ton profits on all production is to be realized.

The Griffin Hot-Blast Process has made big increase of scrap content—under some conditions, even utilization of 100 per cent scrap content—perfectly safe and highly profitable, as demonstrated by numerous time-tried installations:

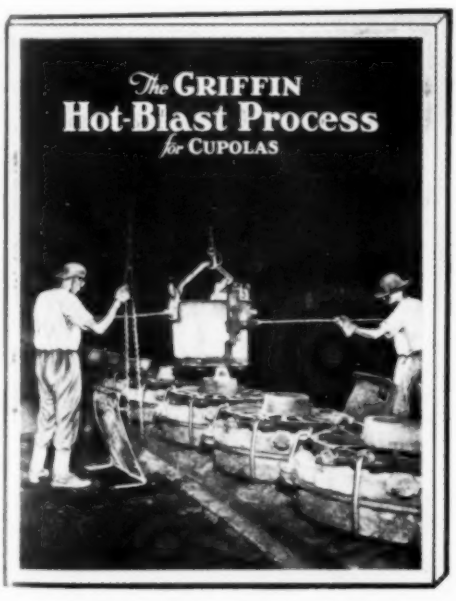
First, at least 25 per cent less coke is burned than with cold-blast operation, and the sulphur pick-up is therefore only three-quarters as great

Second, Griffin continuous cupola melting into a reservoir and mixing ladle permits the desulphurizing agent to be introduced where it mixes readily into the molten mass and is most effective in action, and where the sulphur slag is easiest and most completely eliminated. *Regardless of any greater total of sulphur in the raw stock, uniform desired analysis is dependably obtained in the finished castings.*



100-Ton cupola in a Cincinnati foundry showing collector ring and hot-gas duct of the Griffin Hot-Blast System. The reservoir and mixing ladle is tipped forward to show lining.

As compared to the small proportion of scrap which is the limit in operation with a cold-blast intermittently tapped cupola, the safety of inclusion of a large amount of scrap in charges melted and handled in a Griffin continuous-flow cupola with reservoir and mixing ladle effects savings which are equal to and generally greater than those accomplished through reduction in coke bills alone.



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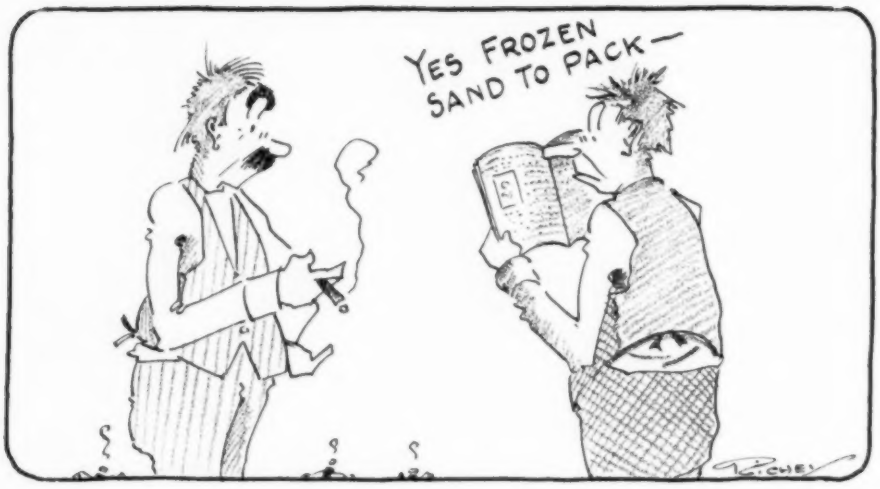


One place where the grain size and permeability do not matter

The Adventures of Bill

By PAT DWYER

WHILE browsing through a national magazine the other day I came across an interesting item in a comprehensive article on Ohio, the gateway state. The item dealt with a new, or at least so far as I am aware, a little known use for molding sand. In this particular instance the sand must be in a frozen condition, a condition in which it cannot be used in the foundry. While commenting on the lake bordered fruit, flower and vegetable garden area between Conneaut and Cleveland, but by some curious oversight omitting any mention of the extensive molding sand deposits in the same district, the author casually refers to the use of the sand:

Shipping uniced mushrooms, say, to Florida, savors of the miraculous until you are initiated into the secret namely, that a few pounds of molding sand when frozen to a temperature of 20 degrees below zero, and placed in a carton of mushrooms, will do for them everything a cake of ice would do, except drip, for a 48-hour period.

I showed the article to Bill and suggested that presumably reference is made to new sand, that is sand freshly dug from the pit and containing the average amount of moisture, from 5 to 10 per cent. Certainly the writer is not referring to dried sand which will not hold the frost. Also we safely may assume that it is not wet sand, that is sand containing 15 per cent or even a greater amount of water. That kind of sand will freeze hard enough, but it will be in a nice squishy mess when it thaws.

"The only thing that surprises me" Bill interrupted at this point," is that some enterprising foundryman has not cut in on this business and persuaded the mushroom lads to pack their product in spent sand from the foundry, rubbish from the dump, rather than in the virgin soil from a deposit in the vicinity of the mushroom mine, or wherever they find those things"

"Maybe I'm dumber than usual at the moment," I said, "but I fail to see what possible argument you could advance, that would influence either shipper or customer to abandon nice clean sand for a mess of old sand tainted with reminiscent scent of sour paste, fish oil, glue, pitch, coal smoke and all the hundred and one combinations of combustible and noncombustible materials that enter into the construction of molds and cores."

"Dumb is the word. I think you also lack the sense of smell and perhaps that of taste. If these faculties were even half developed you would realize the many advantages of old sand over any other kind."

He thinks he has to cook the sand

"All right," I said, in despair "all right. I'm deaf, dumb and blind. My only regret is that I still seem to hear you talking about sand. My sense of smell may not be as acute as that of a blood hound, but it is sufficiently acute to warn me that there is a nigger in the wood pile.

"Moving as you do in the lower altitudes of corn beef and cabbage you have no conception of the dizzy heights others have attained in the selection and preparation of food. Jumping from one dizzy pinnacle to another these experts have developed appetites that continually demand fresh surprise.

"Mushrooms have been served in a great variety of styles, according to a great many recipes and under a great variety of disguises known as sauces and relishes. However, it is doubtful if a mushroom ever was served that tasted and smelled like one would taste and smell after traveling 48 hours in the company of a gob of stale molding sand. You can see the lordly imported chef sniffing the aroma when the box is opened.

" 'Name of a dog' he exclaims in ecstasy. 'What have we here? The smell! Magnifique! Superb! Not since I left that so dear F-r-r-aunce 'ave I smelt such a smell. Now I show you something—some fancy dish—something to—how you say?—something to push one eye from the head, eh?' "

"Now that the question is settled to your—and the chef's—satisfaction." I

said "let us pass on to the next order of business, *Foundry Practice*. Have your scouts brought in anything new from the firing line?"

"What would you think," Bill inquired, "if I told you of an instance where 331 consecutive heats were taken out of a cupola and not a cent spent for clay or brick repairs?"

"Well ," I admitted cautiously, "I should wait for further particulars. Sometimes words are tricky and are not to be taken at their face value. The man who owned the cupola might have used plenty of clay and bricks and then gone to bankruptcy.

"Another possibility is that the cupola was large and the heats were small. Any foundryman who has been forced by economy or necessity to take—say—a 1-ton heat out of a 4 or 5-foot cupola, knows that the brick lining hardly shows evidence of being in use. Conceivably a man might run a cupola on that basis for years without having to repair the lining either with clay or bricks.

"Another possibility that occurs to me is the belief of some foundrymen that bricks should be charged up only when the entire lining is replaced. The bats or splits or even whole bricks inserted for repair in the melting zone before each heat are not considered worthy of mention. This, despite the fact that in many instances one and sometimes two complete rows of bricks are replaced.

"Seems to me I read a statement some place to the effect that a statistically minded bird had worked out the cost of repair brick based on the tonnage of iron melted. On long heats he found that the proportion worked out to 1.6 bricks per ton of iron melted, and that represented highly skilled practice. In many instances the proportion was much higher. In fact so many factors enter into the operation of a cupola that—as I said in the first place—I should like to have further particulars before accepting your statement that neither brick nor clay were used to repair a cupola which melted 331 consecutive heats. Do you realize that 331 heats means over 13 months elapsed time on a daily schedule and over two years on a schedule of three heats a week?

"Well," said Bill, "I'll tell you. A young man recently returned from a trip through this sovereign state of Ohio, told me of visiting a foundry where the superintendent amazed him by stating that he had taken 331 heats out of his cupola and never had used a brick or a gob of daubing to repair the lining.

"I raised all the points you have raised with the idea there was a catch to the story some place. Then I decided to apply for information to the original source. You know almost any story can become distorted in passing through several hands. A seemingly unimportant feature is forgotten. One word is used in place of another and the entire impression is changed. I wrote the foundry superintendent expressing doubt of the extraordinary performance.

"You need not tell me the rest. He never answered your letter."

"I'd hate to have to depend on you to pick 'em for me at a horse race or to make a stab at anything in which there was a chance of making a wrong guess. This friendly foundryman confirmed the statement, described his method of operation and sent me an elegant sketch drawn by his own hand to illustrate his account. Here I shall read you the one and show you the other and that will give you enough to think about for one night."

The cupola is lined to 48 inches diameter in the shaft. Commencing at a point 20 inches above the tuyeres the lining gradually is constricted downward until it attains a minimum of 34 inches at the plate supporting the cupola blocks. Air from the windbox enters the cupola through a continuous tuyere with a total area of 318 square inches.

"You will note here," Bill remarked in parenthesis, "the area of the tuyeres is in the proportion of 1 to 3 compared with the area of the cupola at the constricted neck, and in the proportion of 1 to 6 at the normal or 48-inch diameter of the cupola. The area of the cupola at the neck is slightly over 900 square inches. Above the constricted section, the area is over 1800 square inches."

Air is supplied by a positive pressure blower running at a speed of 230 revolutions per minute and delivering 4000 cubic feet. The tuyeres are 20 inches above the sand bottom. The coke bed extends 30 inches above the tuyeres and the charges are made up of 2000 pounds of iron, 200 pounds of coke and 45 pounds of limestone. The average heat extends over 3 hours, a total of 993 actual melting hours for the 331 heats. In that period we have melted 8481 tons of iron, an average of 25.62 tons per heat

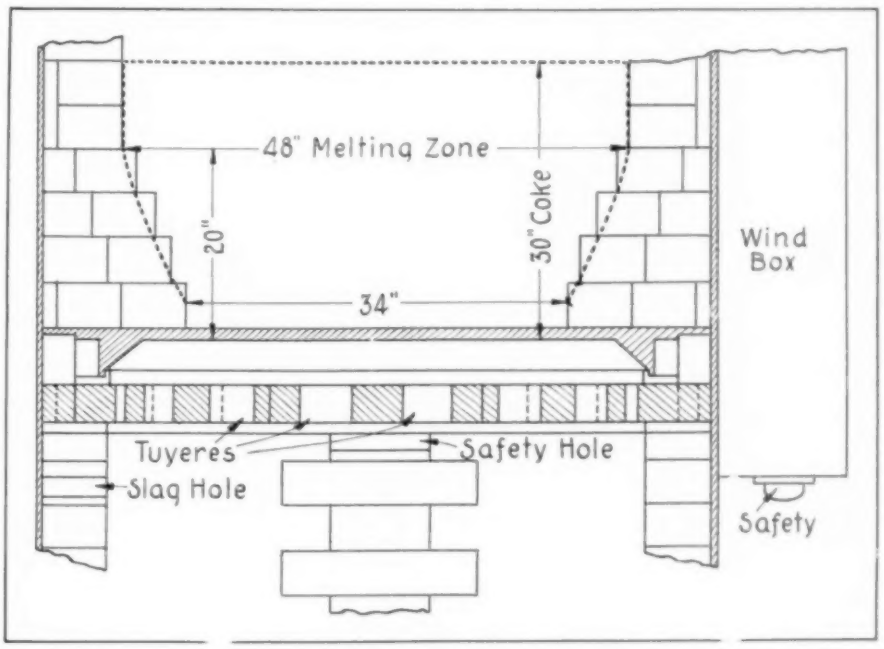
"Pretty good melting," Bill commented, "Over 8 tons per hour for a 48-inch cupola."

The cupola is lined with blocks instead of the usual bricks. The projecting corners of the three lower courses burn off during the first few heats. After that no further recession takes place. Any adhering slag is chipped from the face each morning and the surface is brushed with a thin slurry, a 50-50 mixture of sharp sand and fireclay.

Long life of the lining is due to the same principle that enables a blast furnace to run continuously for several years on a single lining. The tendency of the blast to cut the lining to a certain depth is anticipated by flaring the lining outward from a point above the blast entrance. By experiment one can determine the amount of flare required, the best shape and size tuyeres, the area at the constricted line. With these factors co-ordinated properly the lining will last indefinitely.

The only difficulty about the present type of lining is to find a heat resisting iron for the tuyeres. The cupola blocks are intact but we have to change the tuyere castings. They warp out of shape, crack and finally fall to pieces.

"Now," said Bill "There y'are. The relative merits of the boshed and the straight cupola have been argued by foundrymen ever since Jonathan Ireland first took out a patent on a boshed construction and a double row of tuyeres away back in 1858. Many boshed cupolas are in daily use and many others have been converted to the straight wall type.



The sharp corners of the bricks gradually assume the shape of the dotted line

Classify Materials in Yard

(*Concluded from page* 29)

pounds. A weighing device suspended from the trolley that passes along in front of the bins consists of a 1-ton capacity chain-operated trolley and a ½-ton plain trolley connected by a pair of 5-inch channels about 5 feet long. A weighing scale of the type ordinarily used for weighing structural steel hangs from the channels, about a third of the way from one end.

Tubs are lifted on and off the scale hook by a bail that fits all. This loose bail is raised on and off the scale hook by a lever connected to the 5-inch channel above by a pair of links hanging just under the 1-ton trolley at the back. The front end of the lever is equipped with a ring to engage the hook of the ½-ton block which hangs just beneath the ½-ton trolley at the front of the device. This arrangement gives the operator a 3 to 1 leverage on the load with a high speed chain block and enables him to raise the tub and set it down with maximum speed. The adjusting weight on the scale is set to compensate the weight of the tub and the lifting bail.

When the empty tub is hung on the scale hook and the lifting bar lowered to clear the bail, the scales balance.

Loading the tubs thus becomes a one man operation. The geared trolley at the back, enables the operator to move the whole apparatus back and forth in front of the bins as he may desire. The device is unbelievably sensitive. A good pull on the hand chain of the geared trolley will send the full load flying along the trolley beam.

The yard man is given a sheet covering the charges for the day. Each tub bears a number corresponding to the charge number appearing on the sheet.

Bins also are numbered and the sheet shows how many pounds of materials from each bin goes into each tub. The foundry foreman is in complete charge of his materials at all times and the chance for error is small.

Loaded tubs are set aside by the crane and when the required number of charges are made up, they are hauled by a truck, six charges to a load, across the railroad tracks to the foundry. There they are removed from the truck with an electric hoist, raised to the charging floor, lowered on a lift truck and lined up before the charging door of the cupola in the order in which they will be charged. As with all simple and efficient systems it was long aborning; but it works splendidly, gives a minimum of trouble and we feel that our raw materials handling difficulties are pretty well smoothed out.

Coke is unloaded from the car into an electrically operated lift which delivers it to a concrete storage room with a capacity of 3 carloads on the charging floor level and only a few feet from the cupola. Limestone comes up in occasional tubfuls on the same hoist that brings up the metals.

This method of separating, classifying and segregating the materials and handling them with a simple and efficient apparatus goes a long way in establishing the quality of the castings and in lowering their cost.

Made Sales Manager Of Equipment Company

Lester B. Knight Jr., has been appointed sales manager, National Engineering Co., Chicago, manufacturers of sand mixers and sand handling and conditioning equipment. Mr. Knight became connected with the National Engineering Co. in 1930 as sales engineer and previous to that was affiliated with the Illinois Clay Products Co., Chicago. He is a graduate of Sibley college of mechanical engineering, Cornell university, Ithaca, N. Y., and has been active in the work of the American Foundrymen's association, serving on several committees and contributing papers on the use and application of synthetic sand.

Institute Groups Study Alloys and Costs

F. B. Coyle, development and research department, International Nickel Co., New York, spoke on recent developments in alloy cast iron at the quarterly technical meeting of the Wisconsin chapter of the Gray Iron institute, held at the Hotel Schroeder, Milwaukee, recently with E. L. Roth, Motor Castings Co., in charge. Discussion of the meeting centered around the work which is being done on preparation of specification for gray cast iron.

Quad City chapter of the institute met at the Leclaire hotel, Moline, Ill., on April 20 to discuss foundry costs, with particular reference to the melting department. The meeting was in charge of Miss M. B. McGugin, chairman of the cost committee, Quad City chapter of the Gray Iron institute. The group plans to meet frequently for cost discussions, and will consider different departments of foundry costs at respective cost meetings.

During recent months groups of members of the institute, in 12 foundry centers, have been giving careful thought and attention to developing local chapters, functioning with the assistance and guidance of the institute office. The groups are holding monthly meetings discussing technical, cost and merchandising activities of the organization and considerable work of importance has been accomplished.

Specifications Cover Plumbing Fixtures

Information on several types of cast materials is contained in proposed federal specification on plumbing fixtures for shore purposes which was published recently. The specification states that the composition of red metal and white metal not required to be plated shall be uniform in color. Brass shall contain not less than 65 per cent copper and not more than 5 per cent lead. Red metal for cast purposes shall have the following composition by weight: Copper, 85 per cent minimum; lead, 4 per cent maximum; tin, 5 per cent minimum; zinc, 7 per cent maximum.

White metal, (nickel silver or nickel bronze), shall have the following compositions by weight: Copper, 62 per cent minimum; nickel, 19 per cent minimum; tin, 2.5 per cent mimimum; lead, 6 per cent maximum; zinc, 10 per cent maximum; manganese, 1 per cent maximum; iron and other impurities, 1 per cent maximum.

To Handle Cranes

Industrial Construction Corp. Ltd., 5125 Santa Fe avenue, Los Angeles, has been made agent for the Shepard Niles Crane & Hoist Corp., in Southern California, Arizona and a part of Nevada. W. W. McClung, formerly vice president and production manager, Union Iron Works, is president of the Industrial Construction Corp., Ltd., Ray E. Davies, formerly manager of the crane and hoist division of the Consolidated Steel Corp., is vice president and Elmer Bisbee, formerly sales manager and chief estimator of the Union Iron Works, is secretary-treasurer. A. J. Werner, R. C. Arquette, and J. C. Drulard also are associated with the company.

Frick-Reid Supply Corp., Pittsburgh, has been appointed representative by the Richards-Wilcox Mfg. Co., Aurora, Ill., for trolley and I-beam conveying systems.

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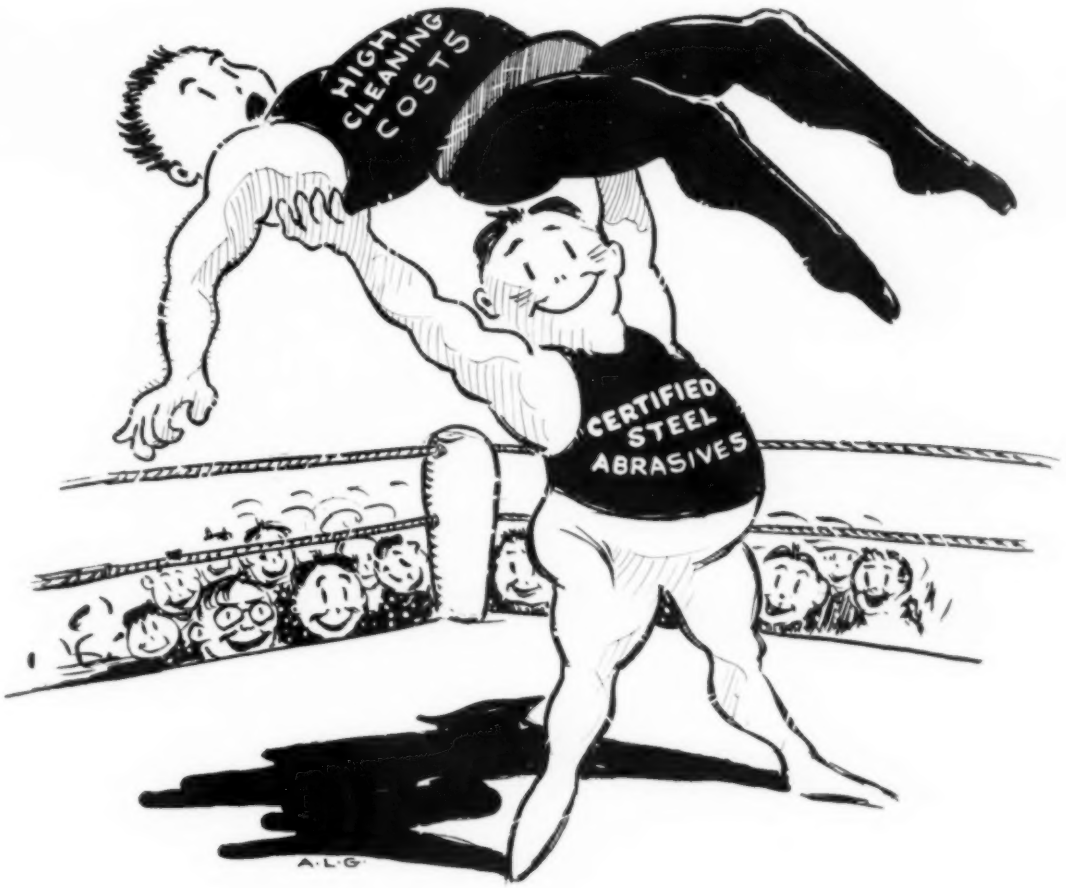
Steel Abrasives



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Iron Lighthouse at Cape Henry

(*Concluded from page* 31)

house constructed almost entirely of cast iron has not seen so much of war in the 50 years of its existence, but it has seen the volume of shipping increase with every succeeding year. A considerable volume of naval and military supplies and equipment poured out of the Chesapeake in the Spanish war of 1898. During the World war thousands of troops sailing out of Norfolk passed Cape Henry light, the last visible point of contact for many a day —with some forever—between them and their native land.

A Constant Parade

A constant stream of shipping to and from Chesapeake Bay ports flows day and night between the Virginia capes. Naval vessels have business in Norfolk, Washington and Annapolis. Cargo steamers bring crude oil and sugar to the refineries of Baltimore. Grimy tramps come into Norfolk for bunker and for coal cargoes. Masters and crews of passenger and freight steamers of the Old Dominion, the Merchants and Miners Transportation and a dozen other lines are as familiar with Cape Henry lighthouse as they are with the docks at each end of the journey. Vessels built by the Newport News Shipbuilding & Drydock Co., slip down the bay and out past Cape Henry for a trial run off the capes.

The original Cape Henry lighthouse had seen almost 100 years of service when congress voted $125,000 in two appropriations for the construction of the new edifice. Unfortunately no data is available to show who was responsible for the specification, or why cast iron was specified as the material of construction. It is regrettable that foundrymen of the period did not follow the lead and develop new fields for their products. However, it is not too late with this structure to serve as an object lesson, a tangible proof of the adaptability of castings and their resistance to decay.

Contract for furnishing the metal work in the tower was awarded in 1879 to Morris, Tasker & Co., Ltd., Philadelphia.

Cape Henry light is one of the primary lights and an important signal and radiobeacon station. It is operated electrically and is rated at 80,000 candlepower, the lens being 150 feet above the ground.

The octagonal structure is slightly tapered. The outside shell of cast iron plates is connected through suitable brackets with the inner stair cylinder of wrought iron. The main entrance at the foot of the tower gives access to the ground floor, an octagonal room of ornate design. A spiral cast iron stair leading past six cast iron landing stages, extends to the service room. The landings are supported on cast iron brackets. From the service room, the stair leads to the floor of the watch room and thence to the floor of the lantern room. This room with 16 sides is constructed of cast iron and glass. Two outside galleries surround the upper part of the tower, one at the level of the watchroom floor and the other flush with the lantern room floor.

The firm of Morris, Tasker & Co., Ltd., long since has passed out of existence, but many firms still doing business trace their origin to offshoots from that organization. THE FOUNDRY is indebted to P. H. Morris, Cresson-Morris Co., Philadelphia, for interesting historical detail on the plant where the cast iron lighthouse was fabricated.

For some time prior to 1820 the Morris family conducted an iron works at what now is 16th and Market streets. In the early twenties Stephen Paschall Morris withdrew and with Thomas Tasker started an iron foundry at Third and Pear streets, principally for the manufacture of coal stoves then coming into use. The business expanded and the Paschall Iron Works, a foundry, was erected on the plot of ground bounded by Fourth and Fifth streets and between Morris and Tasker streets. That foundry while still retaining its name, later became part of the iron works of Morris-Tasker Ltd.

Products Expand

The first wrought iron pipe made in the United States is said to have been manufactured in that plant in 1846. Other products included ornamental iron works, valves, fittings, and later, gas lighting equipment, holders, lamp posts, etc. The name of the firm was changed to Morris, Tasker & Morris.

In the early seventies, land was purchased at Newcastle, Del., and a plant was erected for the manufacture of wrought iron pipe. In the late nineties or shortly before 1900 the interests were taken over by the National Tube Co. and later by the United States Steel Corp., in the mergers of pipe companies prevalent at that period. Thus the firm of Morris, Tasker Ltd., went out of existence.

Title to the land upon which Stephen Paschall Morris and Thomas Tasker established their foundry originally was obtained by Anthony Morris in 1750. The plot extended from the Delaware river to Sixth street and south from Morris street below the Wharton estates.

Following the removal of Stephen Paschall Morris from the site at Sixteenth and Market streets about 1825, another Morris firm was formed to operate the plant on this site in 1828.

In 1846 Isaac P. Morris removed to Richmond to start the Port Richmond Iron Works, later to be widely known as The I. P. Morris Co. Descendants of the Morris family continued with the various companies and also were interested in other firms notably the Southwark Foundry & Machine Works and the Cresson-Morris Co. Eventually the Morris interests in the I. P. Morris Co., were taken over by Wm. Cramp & Son, but the firm name was retained.

In recent years the Southwark Foundry & Machine Works, the Cramp Morris Industrials Inc., a combination of Wm. Cramp & Sons, I. P. Morris Co., and the DeLaVergne Engine Works, were taken over by the Baldwin Locomotive Works and activities centralized at the plant in Eddystone, Pa.

Coat the Iron

Returning now to the cast iron lighthouse, it was set up in sections in the yard of the plant. One of the specifications called for a coating of linseed oil to protect the surfaces from oxidation. Attempt first was made to use boiled linseed oil, but the cost was high and a great deal of difficulty and danger was experienced in attempting to boil the oil in great iron kettles set up in the yard. The oil persisted in catching fire to the great expense of the firm, imminent risk to the buildings and grievous hazard to the clothing, the life and limb of the workmen. Raw linseed oil eventually was applied. In view of the subsequent 50 years resistance to the elements, the disinterested observer might be pardoned for doubting the wisdom of the individual or board which included the linseed oil item in the specifications.

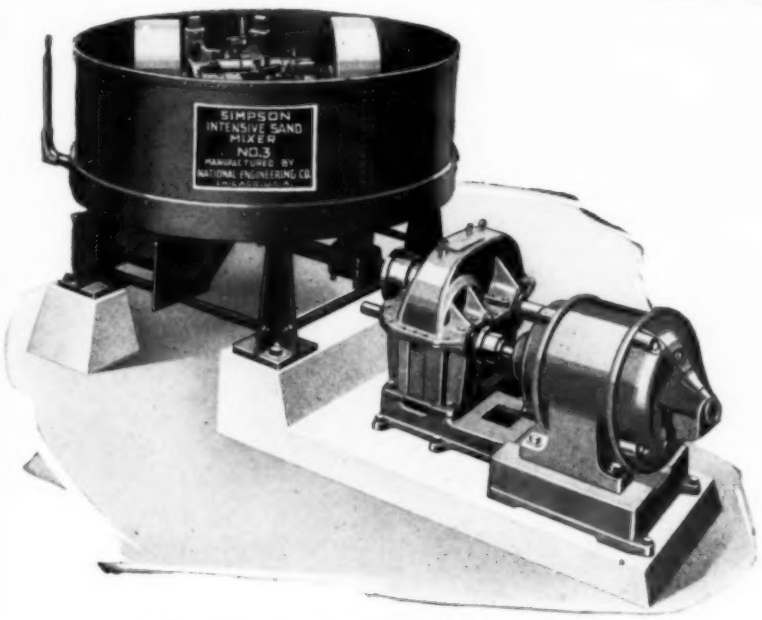
The A. J. Creswell Iron Works, Philadelphia, fabricated another cast iron lighthouse about 25 years ago and erected it at Lewes, Del.

Study Effect of Temperature on Metals

Joint research committee of A. S. T. M. and the A. S. M. E. on effect of temperature on properties of metals has perfected plans for sponsored researches at the University of Illinois, Urbana, Ill., and the Battelle Memorial institute, Columbus, O. The work at the university under Prof. H. F. Moore, will relate largely to endurance properties of austenitic nickel-chromium steels at different temperatures. That work will be coordinated with creep tests at Battelle institute under Dr. H. W. Gillett as well as with studies at various industrial laboratories relating to the structural stability of the steels and the changes in various properties with time at high temperatures.

SAND MIXERS

• PLUS!!



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Molybdenum in Gray Cast Iron

(*Continued from Page* 21)

In irons from the cupola these attributes are not confined merely to ideal base cupola iron of low total carbon content and moderate silicon content, as 3.10 to 3.30 per cent total carbon, 2.00 to 2.20 per cent silicon, but appear in distinctly soft iron even as high as 3.50 per cent in total carbon and 2.40 per cent in silicon. They appear also in malleable iron and in the new high test irons of the modified malleable base type, and of course in the high test irons of the electric furnace. It is significant that benefits in improved service for certain specific uses accrue in the soft irons, even where molybdenum iron does not show a higher brinell hardness, since a closer grained iron in the heavier sections (capable of taking a high polish) and giving a better wearing surface is achieved by the use of that alloy.

List Results Obtained

These effects will suggest readily the usefulness of molybdenum to the iron foundry industry in making better gray iron. Listing of the general properties already published, with test results on various classes of iron, will show what is being done with the alloy in manufacturing iron to meet special requirements. Molybdenum is used to attain tensile strengths as high as 50,000 pounds per square inch in automotive cupola irons, and 60,000 to 70,000 pounds per square inch in electric furnace and air furnace irons and even in high-steel cupola iron carefully made.

Table I lists some generally determined physical properties obtained industrially from cupola iron, electric furnace iron, and air furnace iron alloyed with molybdenum, with details of the chemical composition of the respective irons. This table is compiled entirely from routine test results.

Table II shows results obtained in the laboratories of the Climax Molybdenum Co. as the result of adding molybdenum to high grade plain carbon gray iron, and illustrates the progressive, cumulative, and comparative effects of such treatment.

Many special duty irons for cast crankshafts now contain molybdenum. Operating tests on such irons have shown a high resistance to failure from fatigue stresses induced by eccentric loading, which varies from two to four times that of steel forgings. Camshafts of molybdenum iron have shown entirely satisfactory performance in service tests with excellent wear resistance. Indeed molybdenum cast iron appears likely largely to invade these fields, especially as it offers a possible economy over the use of carburized or heat treated steel forgings.

An important physical effect of molybdenum on gray iron, which steadily is becoming more definitely established, is its tendency to increase the deflection figure of the transverse test. Data shows an increase in deflection as high as 25 per cent over that of the plain iron. High transverse strength and high deflection together indicate good elastic properties, and are used by many as an index of quality for gray iron.

Still other important properties of molybdenum iron are its high creep strength value, and strength at high temperature. These have been established by several investigators, notably those of the Battelle Memorial institute, and undoubtedly account for some of the superior performance under heat reported in service for such parts as cylinder heads, glass molds and die casting molds. Possibly the strength at high temperature is a factor in the effect of molybdenum in combating fire cracking in steel-mill rolls.

Add Several Elements

The field of double and triple alloy irons, namely the use of molybdenum with nickel, with chromium, and with nickel and chromium irons, need be touched upon only briefly. Viewed from the practical standpoint, nickel aids the machinability of a high molybdenum iron (0.50 per cent molybdenum or more) while chromium increases its hardness and its resistance to graphitization under heat. Viewed from the theoretical standpoint, the combination of the alloys of molybdenum with chromium and/or nickel under favorable conditions shows a range of physical

(*Concluded on Page* 60)

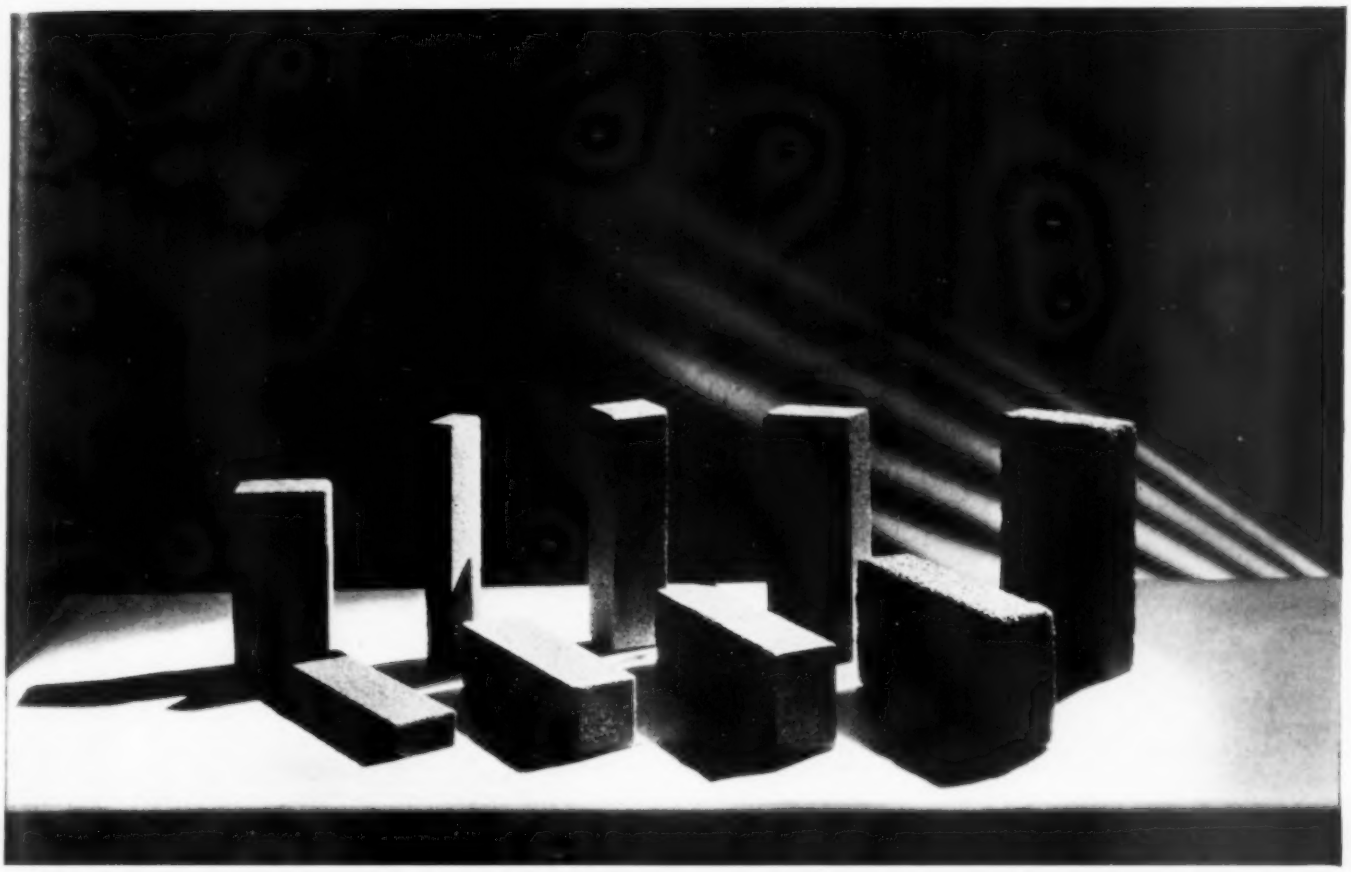
Table II

Progressive Effect of Molybdenum Or Molybdenum-Chrome on Cylinder Iron

		CHEMICAL COMPOSITION											PHYSICAL PROPERTIES				
	Alloys	Total Carbon	Combined Carbon	Graphite	Silicon	Manganese	Molybdenum	Chromium	Nickel	Sulphur	Phosphorus	Brinell Hardness	Transverse Load 18-inch Centers	Deflection (inches) 18-inch Centers	Transverse Load* 12-inch Centers	Deflection (inches)** 12-inch Centers	Tensile Strength, Pounds Per Sq. In. Average 4 Bars
1	1.50 Ni.	3.22	0.63	2.59	2.06	0.58	....	..	1.65	0.084	0.21	207	2618	0.216	4360	0.108	41470
2	.25 Mo.	3.26	0.61	2.65	2.06	0.56	0.26	..	....	0.079	0.22	207	2700	0.279	4500	0.139	42900
3	.50 Mo.	3.23	0.71	2.52	2.06	0.55	0.58	..	....	0.078	0.21	207	2855	0.262	4760	0.131	43560
4	.75 Mo.	3.25	0.69	2.56	2.06	0.56	0.82	..	....	0.075	0.21	217	3009	0.294	5020	0.147	45705
5	1.20 Mo.	3.21	0.64	2.57	2.06	0.58	1.23	..	....	0.072	0.20	223	2915	0.222	4860	0.111	49100
6	.40 Mo. .25 Cr.	3.23	0.75	2.48	2.06	0.56	0.39	0.27	....	0.080	0.20	228	2904	0.242	4840	0.121	49985
7	.75 Mo. .25 Cr.	3.19	0.71	2.48	2.06	0.55	0.75	0.26	....	0.077	0.20	228	3124	0.209	3210	0.104	52470

*Calculated on basis of conversion load on 12-inch centers = Load on 18-inch centers ÷ 0.60

**Calculated on basis of conversion deflection on 12-inch centers = Deflection on 18-inch centers ÷ 2 } as usually practiced



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(*Concluded from Page* 58)

properties for cast iron which suggests that the matrix partakes somewhat of the properties of a high grade alloy steel. For example, molybdenum-nickel electric furnace irons of about 65,000 pounds per square inch tensile strength shown in Table I have torsional strengths of the order of 55,000 inch pounds.

With regard to the matter of grain refinement, that is of the securing of a truly close-grained iron in heavy sections, the density of molybdenum irons not only is apparent visually but actually is proven under the searching scrutiny of brinell tests taken completely across the section. Tests reported by J. T. MacKenzie showing a tensile strength of 38,600 pounds per square inch and transverse of 12,020 in the center of a 10-inch section as compared to one of 39,000 pounds per square inch with a transverse of 12,710 near the circumference of the bar are in line with the experience of many others who have found that molybdenum builds up high torsional strengths and uniform brinell hardness in heavy cross sections of low-carbon gray iron.

If molybdenum tends to disperse graphite particles and to sorbitize pearlite, it might reasonably be expected to produce fine-sized temper-carbon particles as well as increased depth-hardness in the heavier sections in the making of special high test iron articles from the low-carbon, higher-silicon malleable base type by short annealing. This has been demonstrated to be the case by actual experience. The same tendency to finer particles of highly dispersed temper-carbon is found in regular malleable which has had an addition of molybdenum in the hard iron.

It is interesting to recall the suggestion made when the early work on molybdenum in gray cast iron was being done. From the fact that some of the alloy went into solid solution in the true iron it was suggested that the resultant molybdenum-containing austenite should be a more sluggish medium for the travel of growth of precipitated carbon. That idea adequately covers facts now abundantly demonstrated in the observed carbon dispersal in malleable and gray irons.

Influence of molybdenum in increasing the impact strength, or toughness, of cast iron has been mentioned earlier as of outstanding importance, but so far there are few numerical data on that property. It is well known that there is at present no standard impact test for cast iron which will evaluate properly its shock strength in units permitting proper differentiation of various irons in respect to impact resistance.

Standard notched bar tests (Izod or Charpy) obviously are too drastic in the case of a discontinuous metal containing free graphite, so that while some work has been done with those tests, the data obtained are not consistent. Some investigators use a repeated drop test which gives consistent results; the values obtained are quite empirical, and while valuable for control work as individual shop standards, are not readily comparable.

On the average, the tests show high grade molybdenum cast irons to have shock-strengths at least double those of plain-carbon gray irons. Tests to destruction on actual castings, for example breaking with a sledge, immediately show the marked toughness of this alloy iron. The path of the fracture in the broken casting strengthens the evidence of the toughening effect of that alloy. Where the fracture in a plain iron casting will follow a change in section or a joint, in the molybdenum iron the fracture frequently will follow a zigzag course extending into the adjacent sections, thus showing that the latter metal is definitely a less brittle material than is the former.

In the higher strength irons of 60,000 pounds per square inch and over, the structure usually is predominantly sorbitic with some excess cementite, and in some of the high alloy irons may even be martensitic in nature. There may be free cementite in the harder irons, but they have noticeably fewer carbide areas than most alloy irons of equivalent brinell hardness. Structure of the matrix may vary, according to the type of the iron and its alloy content and cooling conditions, from fully lamellar pearlite, lacy pearlite, granular or fully sorbitic pearlite, and sorbite, to a partly martensitic structure.

Tendency of the pearlite to be finely divided and free from coalescing ferrite is evident. Molybdenum alloy pearlite in either its lamellar or lacy sorbitized form has superior wear resistance because of its nature; and it has been said that it consists of complex carbides of iron and molybdenum alloyed with molybdenum-ferrite, since some of the molybdenum has gone into solid solution in the ferrite and some into combination with the combined-carbon portion of the metal.

Changes the Iron

INTERESTING factors which have been brought out in various studies of the effect of molybdenum on gray cast iron are discussed and enlarged upon in this article, which is abstrated from a paper presented at the recent Detroit convention of the American Foundrymen's association. The authors are connected with the Climax Molybdenum Co., Detroit.

Is Made Manager Of Sandblast Sales

Charles T. Bird recently was made manager of sales, sand blast and dust arrester division, the American Foundry Equipment Co., Mishawaka, Ind. Mr. Bird, who was educated in England, has had several steel mill connections and he also was assistant manager in charge of engineering, the American Steel Foundries, Alliance, O., plant. He then became connected with the Pangborn Corp., Hagerstown, Md., where he occupied various positions of importance for 15 years. Mr. Bird is a member of the American Society of Mechanical Engineers.

Charles T. Bird

Cites Obligation of University and Industry

"The University and Industry" was the subject of a talk by B. G. Elliott, professor of mechanical engineering, University of Wisconsin, Madison, Wis., at a meeting of the Wisconsin Gray Iron Foundry group held at the Hotel Schroeder, Milwaukee, on May 11, with Prof. R. S. McCaffery, University of Wisconsin, presiding. Professor Elliott showed the dual responsibility of state supported universities and of industry in the state, in assuring sufficient equipment and personnel to work out the fundamental data necessary for the continued progress of industry.

Design Influence on Brass Castings

(*Continued from page* 25)

the tapering may take the form of only a small fillet to avoid the right-angle bend, but in any event it will greatly aid in the elimination of stress concentration at such an intersection and is most essential at the junction of thick and thin sections.

In Fig. 5 a too-liberal use of fillets at the intersection of ribs has caused an increase in the width of the intersection and thus has caused nonuniformity at that point. This may be overcome, as shown on the right of the illustration, by coring out the center of the intersection down to the body of the casting.

Design of Bracket

Fig. 6 gives an example of staggered ribs designed to avoid intersections. The fillets also are slightly reduced. The diagonal bracket shown as poor design in Fig. 8 is a common error. The bracket has been made larger than the adjoining metal to add strength to the casting, but it has quite the opposite effect. The two sides of the triangle will solidify before the hypotenuse and thus center the solid contracting stage with a tendency to shrink away from the thicker member before the latter is completely solid. The bracket should be of equal thickness whenever possible, as shown at the right of the drawing.

Fig. 9 shows poor and good design for bolting plates or pads. Such projections should be cored out so that the cross section of the members will be as uniform as possible with the body and thus avoid unnecessary increases in local thickness. Fig. 11 gives another illustration of coring out of a projection to maintain, as far as possible, equal thickness of metal. The lug is changed to a flange in this case.

Fig. 12 shows a great reduction in metal thickness by modification of design without decreasing the bolting or bearing surface of the projection. In Fig. 14 uniform cross section is obtained by coring out a section around the lower circumference of the casting. This also results in lightening the casting.

Fig. 15 gives an illustration of a threaded collar on the end of a casting causing nonuniformity of metal. Uniform thickness of metal is obtained as shown on the right of the drawing. Fig. 16 shows a rectangular key-way with sharp corners and regular ribs. This design may be improved by substituting a rounded ridge over the key-way and easy-rolling ribs, as given to the right of the drawing. A slight fillet also may be inserted in each sharp corner of the key-way.

The large bronze casting illustrated by the photograph reproduced as Fig. 2 is the result of co-operation between designer and foundryman, and represents practical example of the principles previously mentioned. The casting has a large flange on each end and many projections on its body. Attention is directed especially to the coring out of the interior of the large flange visible in the foreground of the photograph. Figs. 1, 10, 13 and 17 give details of this casting or examples that would be applicable to such a design. In Fig. 17 note the care taken to avoid inequalities of section on the projections shown.

Making Rectangular Flange

Fig. 1 shows a large rectangular flange, in the center of the picture, which has been carefully cored out below. Note also the easy rolling ribs and the rounded ridge extending the width of the illustration. This ridge is the outer and top surface of a key-way on the interior of the casting.

Fig. 13 shows a round flange in the center of the illustration, with a small boss on its right.

Fig. 10, is a close view of a large bolting pad, and attention is particularly called to the coring out of this projection and to the fact that sharp corners were avoided in accomplishing this modification.

The principles described have been applied in practical production with marked success, and it is hoped that the future will bring even more co-

Brass and Bronze

THE numerous examples showing good and bad design of certain castings made of brass and bronze should be of interest to foundryman and designer alike. The article is from a paper presented at the recent Detroit convention of the American Foundrymen's association. Mr. Fawcett is metallurgist, United States naval gun factory, navy yard, Washington.

Table I

Required Chemical Composition and Mechanical Properties of Bronze Castings

Chemical Requirements

Navy Department Specifications	Composition Per cent	Cu,	Sn,	Zn,	Pb,	Fe, max.	Ni, max.	P,	S, max.	Sb, max.	Other Elements max.
Phosphor Bronze 46-B-5f	Desired	88.0	8.0	4.0	0	0	.....	0	0	0	0
	Permissible	85.0-89.0	7.5-11.0	1.5-4.5	0-1.0	0.25	0.75	0.5	0.05	0.25	0.35
Gun Metal 46-M-6e	Desired	88.0	8.0	4.0	0	0	.....	0	0	0	0
	Permissible	86.0-89.0	7.5-11.0	1.5-4.5	0-0.30	0.10	0.75	0.05	0.05	0.25	0.15

Mechanical Requirements

Navy Department Specifications	Tensile Strength in Lbs. per Sq. In., minimum	Elongation in 2 in., minimum
Phosphor Bronze 46-B-5f	35,000	18.0
Gun Metal, 46-M-6e	40,000	20.0

Table II

Required Chemical Composition and Mechanical Properties of Brass Castings

Chemical Requirements

Navy Department Specifications	Composition Per Cent	Cu,	Zn,	Pb, max.	Al, max.	Mn, max.	Fe, max.	Sn, max.	Other Elements, max.
Naval Brass 46-B-10d	{ Desired	62.5	36.3	0	0.2	.....	0	1.0	.....
	{ Permissible	60.0-65.0	†	0-1.0	0.5	.....	0.5	0.5-1.5	.....
Manganese Bronze 49-B-3c*		55.0-60.0	38.0-42.0	0.20	1.50	3.50	0.40-2.00	1.50	0.20

Mechanical Requirements

Navy Department Specifications	Tensile Strength in Lbs. Sq. In., minimum	Elongation in 2 in., minimum
Naval Brass, 46-B-10d	30,000	15.0
Manganese Bronze, 49-B-3c*	65,000	20.0

*A high-test brass.
†Remainder.

operation between the designer and the producer of castings so that alloys will not be selected solely for their mechanical properties and that sounder and more serviceable castings will be the inevitable result.

Announce Plans For International Congress

Fourth International Foundry congress will be held in Paris in September, 1932 and will be organized by the Association Technique de Fonderie de Paris. Two short tours will be provided from Sept. 8 to 12. Tour *A*, for the delegates arriving at Calais or Boulogne in the north of France, will be in the northern district, in the regions of Boulogne, Marquise, Lille and Valenciennes. Tour *B*, for delegates arriving at the port of Havre, will include the districts of Havre, Rouen and Caen. Delegates attending both visits will arrive in Paris on Tuesday, Sept. 13.

Formal meetings will start Wednesday, Sept. 14; the official opening of the congress being in the hall of the Sorbonne. The opening meeting will be held in collaboration with the Comite National de l'Organisation Francaise. Following luncheon at the Hotel Lutetia, delegates will visit the international foundry exhibition in the exhibition grounds, Port de Versailles, Paris.

On Thursday morning delegates will visit works in the Paris district. Technical sessions in the afternoon are divided into three sections: General questions, copper and bronze alloys, aluminum and light alloys. A reception will be held from 6 to 8 p. m. at the Hotel de Ville, Paris, the Paris Townhall, and a dinner, followed by a dance, is planned on the first floor of the Eiffel tower at 8:30 p. m.

Friday morning will be devoted to another series of visits to works in the Paris district, and at the technical sessions which will be held in the afternoon, one section will be devoted to cast-iron, one to electric furnaces, and one to various subjects. From 5.30 to 7 p. m. a special session devoted to utilization of various alloys in foundry practice will follow.

Saturday morning will be devoted to a second visit to the international exhibition. A session in conjunction with the Comite des Forges de France at the Comite des Forges Building, 7, Rue de Madrid, Paris, will be held in the afternoon and from 4:30 to 6:30 p. m. a special session will bring the convention to a close.

The official banquet will take place at 8 p. m. at the Palais d'Orsay, and will be followed by a ball organized by the Association des Anciens Eleves de l'Ecole Superieure de Fonderie (association of old fellows of the high school of foundry).

Sunday, Sept. 18, will be devoted to excursions to Versailles and Rambouillet. Two tours will be organized to follow the congress, starting Monday, Sept. 19. Tour *A* in the northeastern regions will include the Ardennes district where foundries at Mezieres, Charleville, Revin, and Fumay will be visited. This tour will be extended to Luxemburg, Saulnes, and Nancy will be visited. Tour *B* will be made in the center of France. Visits will be organized to foundries at Rosieres and Bourges, followed by a visit to the Schneider works and foundries at Le Creusot. Other works will be visited in the regions of Lyon, Ugine and Grenoble. For those who are interested in continuing the tour from a touristic standpoint, arrangements will be made to extend it to Nice by the Route des Alpes.

During the congress a special program will be provided for the ladies who will accompany the delegates, and this program will be organized by a committee of ladies.

President E. Ronceray, Association Technique De Fonderie, Paris, France, announces that arrangements have been made with the French railways whereby a discount of 42 per cent in railway rates will aply for all those participating in the World congress of foundrymen to be held in Paris in September. The American Foundrymen's association office, 222 West Adams street, Chicago, is arranging to assist individual members who may be planning to attend the congress and will bring these individuals into contact so that a party may be arranged.

Appoint Representatives

Bryson Equipment Co., 10228 Woodward avenue, Detroit, has been appointed representative in the Detroit district of the Sandvik Conveyor Mfg. Co. Inc., Newark, N. J.

Foster Mechanical Equipment Co., 918 Cass avenue, St. Louis, has been appointed representative of the Sandvik company in the St. Louis territory.

A New Cleaning Room ECONOMIZER

Announcing the LONG LYFE *American Nozzle*

EVERY USER of blast cleaning equipment can save money by using American Long Lyfe Nozzles. Every nozzle is guaranteed to give a minimum of 200 hours service under any conditions. The average life is 300 to 500 hours. American Nozzles will save frequent changes required with ordinary nozzles. A single Long Lyfe will outwear hundreds of iron nozzles and reduce purchase costs. Blasting results are more uniform because the nozzle orifice holds true to size over a long period of time. But the biggest factor is the savings in costly compressed air.

Read the service guarantee below and use the coupon to obtain further facts and cost of the American Long Lyfe Nozzle.

CERTIFIED GUARANTEE

We hereby guarantee to every purchaser of an American Long Lyfe Nozzle that the nozzle will give at least 200 hours continuous service under any operating conditions. In the event the nozzle fails to meet this guarantee, we will promptly make pro rata refund on the purchase price for the number of hours short of the guarantee.

Sworn to before me this 20th day of May, 1932.

A. O. Banks

My commission expires September 30th, 1935.

President
The American Foundry Equipment Co.

THE AMERICAN FOUNDRY EQUIPMENT CO.

MISHAWAKA, INDIANA

THE AMERICAN FOUNDRY EQUIPMENT CO., MISHAWAKA, INDIANA
Please send me facts and cost of the American Long Lyfe Nozzle.

*Company*_____ *Individual*_____

*Address*_____

Outline Gray Iron Problems

(Continued from May Issue)

APPLICATION of the spiral test to determine fluidity of metal was discussed at the gray iron round table conference on May 3, durin the annual A.F.A. meeting with Harold S. Austin, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. presiding. W. H. Spencer, American Cast Iron Pipe Co., Birmingham, explained how that company utilizes the test in producing centrifugally cast pipe from special mixtures. Results obtained from the spiral test depend upon the silicon and carbon content of the metal as well as the height of the temperature above the freezing point.

C. M. Saeger Jr., bureau of standards, Washington, who presented additional data on the test in a paper at the 1931 convention of the A.F.A., explained that a study had been made of the effect of pouring the spiral in both green and dry sand molds. It was found that the runability is greater in dry sand molds and that moisture in green sand molds has a chilling effect. He pointed to the advantage of having each test mold rammed uniformly, but stated that if the bottom vent from the end of the spiral is kept open, hardness of ramming in general has little effect.

Robert E. Kennedy stated the fluidity test committee, gray iron division, has prepared patterns which may be purchased by those interested. Mr. Austin described a special core, made on a standard core machine, which is used by his company in making the spiral test. The core is 2 inches high and has a vent to prevent back pressure. A pouring basin is provided with a graphite coated stopper and when the basin has been filled, the stopper is removed, thus giving a standard pressure to the metal.

R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston, stated he is using the test to back up temperature readings. Neil A. Moore, Piston Ring Co., Muskegon, outlined a special test on the accuracy of the spiral method, in which he poured 50 pairs of molds, the second of each pair being poured immediately after the first. He found a variation of only plus or minus 1-inch on any pair of molds. He also found that with iron producing a spiral less than 36 inches, some of the piston ring castings will not run. The latter part of the discussion was devoted to chill tests.

A. F. A. Reports

TECHNICAL sessions, shop courses and other activities at the recent convention of the American Foundrymen's association in Detroit covered such a wide diversity of subjects that it was found impossible to present all of the reports in the May issue of The Foundry. Therefore the reports of the gray iron round-table and technical sessions, the steel shop course and the materials handling session are presented in this issue.

Several papers of interest were presented at the gray iron founding session at which H. Bornstein, Deere & Co., Moline, Ill., presided. L. H. Ransom, Keystone Driller Co., Beaver Falls, Pa., described the use of ferro-alloy briquets in the cupola, and stated he had found a decrease in graphite size, and a lower total carbon content. Increased physical properties also were obtained. The recovery through use of briquets was about 85 per cent for ferrosilicon, and 77 per cent for ferromanganese.

E. K. Smith, Electro Metallurgical Sales Corp., Chicago, stated that recovery obtained depends on cupola practice and cleanliness of raw materials used. He said good results were being obtaind through use of ferro-chromium briquets. Mr. Bornstein mentioned that increasing percentages of scrap to the charges gave increased strength through reduction of total carbon content. Hardness also was increased, but machinability was reduced proportionately.

H. H. Judson, Goulds Pumps Inc., Seneca Falls, N. Y., described methods employed for producing high test iron in his foundry. Two cupolas are used; one using a high steel mix, and the other a regular mix for soft iron. Seventy-five per cent of the steel mix metal is added to 25 per cent of the soft iron, and the mixed high test iron is poured into heavy pressure castings. Mr. Judson stated that no difficulties were encountered such as draws, segregations, and high shrinkage. He said that many heavy castings were poured without risers. Test pieces removed from 2¼-inch wall sections and machined to 0.8-inch in diameter showed a strength from 48,000 to 49,000 pounds per square inch. Uniform grain structure from exterior to interior was obtained.

F. W. Meyer, Rockford, Ill., commented that Mr. Judson's results

Members of the party visiting the plant of the Great Lakes Steel Corp. at Ecorse, Mich., on Monday of convention week

were different to the experience of others making high test irons as heavier risers were required. He said he believed that the effect of steel was due to superheat required to begin melting it rather than just dilution of carbon content, and the superheat dissolved the graphite which later was precipitated in a finely divided form.

An abstract of H. J. Young's paper on mixtures, pearlitic cast iron and heat treatment was presented by R. E. Kennedy. Mr. Young showed that by judicious selection of available raw materials, it is possible to obtain metal of the desired quality for a variety of work. The pearlitic structure iron mentioned is that obtained by the Lanz process which includes use of heated molds. Castings with the desired structure may be secured through constant mold temperature and variation of composition; constant composition and varying mold temperatures, or a combination of both. Tensile strengths of the material ranged from 36,000 to 49,000 pounds per square inch; transverse strength, 3800 to 4400 pounds, and brinell hardness from 170 to 270, the latter being for the higher test irons.

J. KentSmith and E. R. Young, Climax Molybdenum Co., Detroit, jointly presented a paper on use of molybdenum in cast iron presented on page 20 of this issue.

The final paper on the program was that by Dr. Marcel Ballay on martensitic quenching of alloy cast irons which was presented in abstract form by Edwin Bremer metallurgical editor, THE FOUNDRY, Cleveland. The paper was presented in the May issue of THE FOUNDRY.

General features and detail of operating a rotary type melting unit known as the Brackelsberg furnace in which powdered coal is used for fuel were described by D. J. Reese, Whiting Corp., Harvey, Ill., at the gray iron foundry session on Thursday. Illustrations of the equipment and log sheets of typical heats taken in a southern foundry supplemented the text of the address devoted principally to operation covering the production of high test cast iron.

C. M. Saeger Jr., and E. J. Ash, bureau of standards, Washington, presented a paper describing a shop method for determining volume changes in cast iron during casting. The paper represents further work done by the authors since the presentation of a paper on the same subject at a former convention. The procedure in the present paper is based on linear contraction of metal shown in three charts. These charts represent a compilation of data from 12 melts of cast iron varying from gray to white.

Adaptability of the open hearth furnace to the production of cast iron from borings was described in a paper by T. L. Joseph and C. E. Wood, United States bureau of mines, Minneapolis. The authors' experiments indicate that cast iron borings can be melted in an open hearth furnace economically provided they are properly protected with slag and small coke. It is claimed that a recovery of 90.00 per cent of the metal charged is possible. If necessary the molten metal may be superheated and manipulated by addition of any necessary alloys and then taken directly from the furnace to the molds. Alternatively the metal may be pigged for future use in the cupola or other melting unit.

A paper prepared by W. H. Spencer and M. M. Walding, American Cast Iron Pipe Co., Birmingham, Ala., describing the effects of eleven metals and alloys on the physical properties of cast iron, when added in varying amounts, was presented by W. H. Spencer. The list included ferrous and nonferrous additions and presented many interesting features not usually encountered in gray iron foundry practice.

Steel Course Features Design

DESIGN of steel castings from the foundrymen's point of view featured the Tuesday shop course on steel. Maj. R. A. Bull, as chairman of the meeting, directed attention to the fact that the welding industry in recent years has diverted a considerable volume of orders that formerly went to the foundry. In some instances the change was inevitable, but in many cases, the change was made through the enterprise of the welder and the inertia displayed by the foundryman. If the foundryman were to confer with the engineer and in many instances suggest modification in design, he would benefit materially.

A member directed attention to one of the well known evils of the industry and claimed that the only reasonable basis on which to sell castings is by the piece rather than by the pound.

Replying to a member who claimed that mechanical engineers should be educated to the uses and advantages of castings, R. A. Bull stated that the American Foundrymen's association and related associations have a handbook in preparation designed for that purpose. This book primarily is intended for engineering schools.

Problems pertaining to the cleaning of steel castings were discussed at the steel shop course on Wednesday under the leadership of P. E. McKinney, Bethlehem Steel Co., Bethlehem, Pa. In explaining certain factors in the cleaning of castings with the sandblast, P. E. Potter, Pangborn Corp., Hagerstown, Md., recommended the use of 60 pounds air pressure when using sand and 80 pounds when employing metallic abrasives. He mentioned that the size of the nozzle should be governed by the type of work to be cleaned. Fifteen to 17 inches is the most effective distance for the nozzle from the work and an angle of 45 degrees is best for general blasting, in his estimation.

Mr., McKinney mentioned the subject of pickling castings and stated the navy is specifying that method of cleaning for certain classes of work. Major Bull believes that for certain types of castings, the pickling method is valuable.

Inspection of castings in the green, or previous to annealing, was discussed at considerable length. H. A. Forsberg, Continental Roll and Steel Foundry Co., East Chicago, Ind., stated that his company has found that cleaning castings before annealing is an economical move, especially in the case of large work. This is true where a local inspector is employed, but does not apply to the same extent where a foreign inspector is required. Methods of preparing castings for welding also were discussed.

Handling Foundry Materials

APPLICATION of monorail handling equipment in the foundry featured a paper presented by J. B. Forker, Osborn Mfg. Co., Cleveland, at the joint materials handling session of the A.F.A. and the A.S.M.E., at which Dan M. Avey, THE FOUNDRY, Cleveland, presided. Mr. Forker outlined the following nine rules to observe in planning handling systems:

1. Keep the method as simple as possible. 2. Use standardized equipment built by responsible manufacturers. 3. Avoid multihandling. Pick up the load where it is and take it to its destination, then set it down. 4. Have an alternative plan for handling that can be used when the main system is out for repairs. 5. Determine an economical load or amount to handle at one time. 6. Do not back track but keep the flow of material in one general direction and the distance traversed at a minimum. 7. Select the type of equipment which

will be most flexible and economical for the demand which will be made on it. 8. Plan for periodical inspection and maintenance. 9. Purchase materials handling machinery for savings, not initial investment.

Mr. Forker showed through examples various applications of monorail equipment in the foundry, starting with the storage yard and following operations through to the finished casting. He also mentioned that overhead monorail soon will find application in the foundry in window washing and building cleaning. Edward W. Beach, and John E. Linabury, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., Delos H. Wray, Henry Wray & Son Inc., Rochester, N. Y., and O. D. Connover, Cleveland discussed various points in connection with the paper.

The methods of handling materials in the small brass foundry of the Western Electric Co., Chicago, were described in a paper by D. G. Anderson and B. F. McAuley of that company. It was pointed out that before the installation, the scrap loss was 8 per cent and since the equipment has been used, production capacity has been doubled and the loss has been cut to 4 per cent. A sand bin larger at the bottom than at the top is a feature of the installation. No trouble is experienced with hot sand near the close of the day. Mr. Beach stated that tests in the Campbell, Wyant & Campbell foundry have shown sand temperatures as high as 170 degrees Fahr. in late afternoon. However, the company endeavors at all times to keep the temperature below 110 degrees Fahr.

H. L. McKinnon, C. O. Bartlett & Snow Co., Cleveland, stated in reply to a question on the balling of sand that the proper speed of the flight conveyor or of the belt, where a plow is used, will eliminate danger from balling. B. D. Fuller, Whitehead Bros. Co., Cleveland, related his experience in correcting a similar difficulty a number of years ago by decreasing the speed of the conveyor.

Nonferrous Founders Study Paper on Red Brass

Connecticut Nonferrous Foundrymen's association met May 9 at the Hotel Garde, New Haven, Conn., with C. H. Blanchard, Reading, Pratt & Cadey Co., Hartford, presiding. F. B Diana, metallurgist, Whipple & Choate Co., Bridgeport, Conn., led the discussion and read the paper "Phosphorus in Red Brass," by R. W. Parsons, Ohio Brass Co., Mansfield, O., which originally was presented at the Detroit meeting of the American Foundrymen's association. The topic proved exceedingly interesting and considerable discussion developed.

C. H. Gale Is Made Life Member Of American Foundrymen's Association

CHARLES H. GALE was elected to life membership in the American Foundrymen's association at the meeting of the board of directors held following the recent convention in Detroit. Mr. Gale started in the foundry industry with the Michigan Stove Co., Detroit in 1874 as a molder apprentice. He was connected with that company 8 years, with the exception of 15 months when he was in Europe working in foundries in France and Germany and taking advantage of the opportunity offered to note the difference in foundry methods in European and American foundries.

After leaving the Michigan Stove Co., he became connected with the Michigan Malleable Iron Co., where he remained for 16 years as molder, time keeper, order clerk, foundry foreman and superintendent. For the next 5 years he was superintendent of gray iron and malleable foundries, International Harvester Co., Springfield, O. From 1905 to 1922 he was superintendent of foundries, Pressed Steel Car Co., Pittsburgh, retiring in the latter year after spending 48 years in the industry.

Mr. Gale's first convention of the American Foundrymen's association was the second held in Detroit in 1897. Although he has not been connected actively with the foundry industry since 1922, he has continued his interest and held his membership in the A. F. A.

Plan Symposium On Gray Iron for 1933

Approval recently was given by the advisory committee of the A. F. A. gray iron division, to a joint symposium on cast iron with the American Society of Testing Materials at that society's annual meeting in 1933. This action followed similiar action taken by A.S.T.M. committee A-3 on cast iron.

The purpose of the symposium will be to present condensed reliable and up-to-date information on cast gray iron for use by the engineer-designer and others who specify metals for industrial application. Recent developments in metallurgy and production methods will provide the committee with a large amount of data of extreme interest to engineers as showing the rapidly broadening field of applications for iron castings.

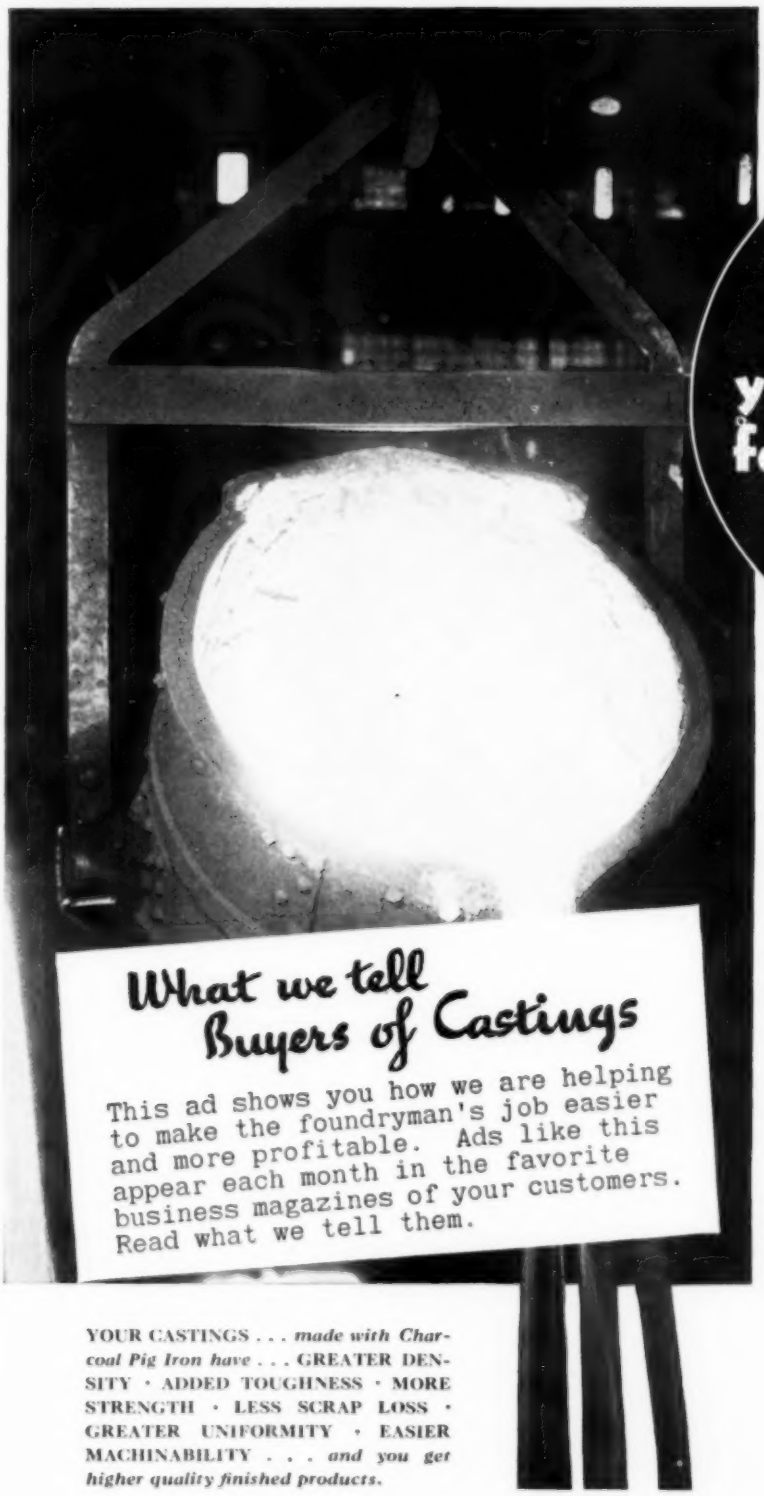
Adopts Policy To Further Foreign Sales

Dust Recovering & Conveying Co., Cleveland, has organized a foreign sales department and has adopted a policy of licensing foreign manufacturers. The Power-Gas Corp. Ltd., Stockton-on-Tees, England, has become associated in that way with the Cleveland firm and will operate for Great Britain and overseas possessions except Canada. Offices of the Dust Recovering & Conveying Co. have been established at 77 Rue des Tanneurs, Brussels, Belgium, under management of engineers of Tevo Ltd.

Colorado Company Celebrates 50th Birthday

The *Blast*, a weekly newspaper issued by the Colorado Fuel & Iron Co., Pueblo, Colo., celebrated the fiftieth anniversary of the founding of the company by the publication of a special double number replete with text and illustration taken from newspaper files and photograph galleries that flourished when the West was young. Contrast is presented between the first modest little establishment and the immense plant with its many ramifications that now give employment to 15,000 employes. One of the group pictures shows an early rail mill crew, rollers and catchers with tongs in hand for manipulating the 30-pound rails current at the period. The steel was blown in bessemer converters and the ingots, blooms and rails were manipulated entirely by hand in the various mills through which they passed. Another group is that of the foundry employes, indicating that then as now the foundry is one of the important units in a manufacturing plant.

ONLY a sentence of 13 WORDS but it can insure you against defective castings


What we tell Buyers of Castings
This ad shows you how we are helping to make the foundryman's job easier and more profitable. Ads like this appear each month in the favorite business magazines of your customers. Read what we tell them.

YOUR CASTINGS . . . *made with Charcoal Pig Iron have* . . . GREATER DENSITY · ADDED TOUGHNESS · MORE STRENGTH · LESS SCRAP LOSS · GREATER UNIFORMITY · EASIER MACHINABILITY . . . *and you get higher quality finished products.*

No one knows better than you do what a source of trouble and needless expense imperfect castings can be. They wear out and break down before their time. They often necessitate costly replacements by weakening your product so much that it collapses under unusual strains.

But why let defective castings cost you unnecessary time and money? Insure against them—just as you do against fire, accident and bad accounts. How? By including this little sentence of thirteen words in your castings specifications: "all castings to contain at least 15% to 20% Superior Charcoal Pig Iron".

That sentence in your orders will bring you castings that are stronger, tougher, denser, more uniform, easier to machine. And it means that foundry scrap loss will be reduced.

Thirteen words! Put them in every specification. "All castings to contain at least 15% to 20% Superior Charcoal Pig Iron".

SUPERIOR CHARCOAL IRON CO.
Grand Rapids, Mich.
Debevoise-Anderson Co., Inc., *Eastern Representative*
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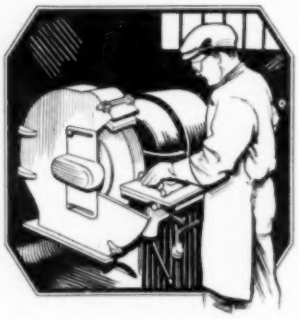
Superior Charcoal Pig Iron

New Equipment For Foundries



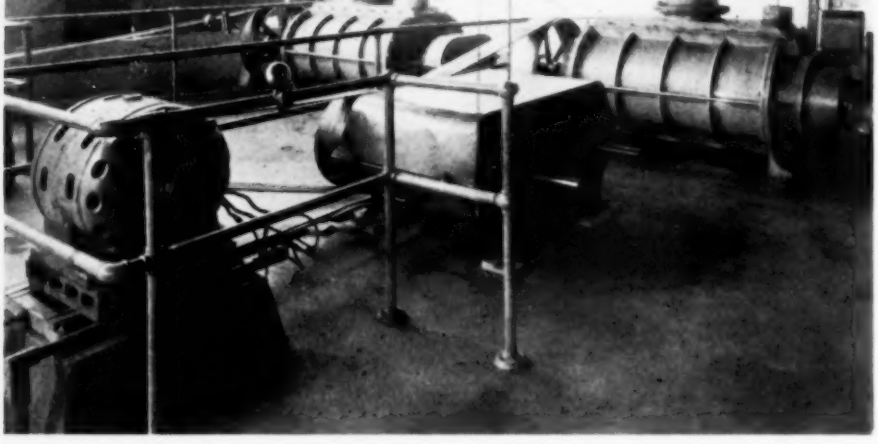
Control Volume Of Air from Cupola Floor

Several refinements have been made in the control of the variable speed drive and positive pressure blower installed at the New Castle, Ind., foundry of the Perfect Circle Co. That installation was mentioned briefly in the Dec. 1, 1931 issue of THE FOUNDRY in connection with a description of operations at that plant. The original installation was developed at the suggestion of Stanley Norrick, Perfect Circle Co., by the Roots-Connersville-Wilbraham division, International Stacey Corp., Connersville, Ind.

Due to the type of castings produced, extreme accuracy in control of all variables is an important factor in the production of sound castings. A slight variation in iron poured around 2700 degrees Fahr., will make the difference between good rings and a high percentage of scrap. The company operates three motor driven positive pressure blowers, one of which has been equipped with a method of variable air volume control operated from the cupola charging floor.

As shown in the accompanying illustration, the blower is driven through a variable speed drive made by the Reeves Pulley Co., Columbus, Ind. The entire unit is controlled through instruments located on the cupola floor. The indicating instrument is connected by wiring to a magneto located on the blower and shown at the extreme right in the accompanying illustration, and is so calibrated that it indicates accurately the air delivered. In the original installation, a hand wheel on the cupola floor was connected through chain drive to the control shaft of the variable speed transmission. After a few months' operation the hand wheel has been replaced by a small reversing motor and reduction gear for operating the variable speed transmission shaft. The motor is under the control of push buttons on the cupola floor.

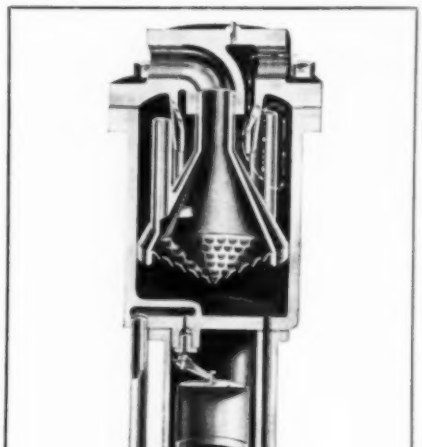
In the Perfect Circle foundry, the operating procedure is as follows: The controlling metallurgist issues specifications for the charge to the foundry foreman, and includes, with the amount of iron, coke, limestone, etc., the cubic feet of standard air required. The foundryman has the charging material prepared, as is customary, and then reads from a chart the cubic feet of air required, taking into consideration the temperature and barometer readings for the day. When the blower is started, the operating speed is adjusted until the instrument on the cupola floor panel board indicates the required volume of air.



The blower is driven through a variable speed unit shown in the center

Builds Combination Air Separator and Trap

Direct Separator Co. Inc., Syracuse, N. Y., has developed a combination air separator and trap for removing oil and water from condensed air. In the separator, the velocity of air downward throws water, which is 127 times as heavy as air at 80 pounds pressure and 60 degrees Fahr., to the top surface of a cone and it drains over the edges to the water chamber.



Oil is removed in combination with the water

Area of the surface of the cone is so large that there is no tendency to lift the water as the direction of the flow is changed upward to and into the top of the three tubes, shown in the accompanying illustration. Air then passes through the tubes and throws any remaining water through the perforated trapping sheet as the direction of flow again is changed.

The oil removed is in combination with the water and the weight of the mixture is about the same as water. An inverted bucket trap has been added to the separator. The trap is so attached that the body can be removed without disturbing the separator.

Obituary

COMM. Carlo Vanzetti, leading Italian foundryman and managing director, Fonderia Milanese di Acciaio Vanzetti, Milan, Italy, died suddenly in Paris Monday, May 30. Mr. Vanzetti, who was widely known to American foundrymen through his activity on the International Committee of Foundry Technical associations, of which he was president in 1930, was graduated from the Ecole Polytechnique of Milan in 1886. In

Comm. Carlo Vanzetti

1888 he began to study the plans for the Societe Anonyme Fonderia Milanese di Acciaio, the first steel foundry to be erected in Italy, and in 1894 he became director and general manager of the firm. At a general meeting of the company in 1929, to recognize the services rendered by Mr. Vanzetti, the style of the company was modified, and it is now known as Fonderia Milanese di Acciaio Vanzetti.

This firm originated the manufacture of steel castings in Italy, first with small converters, then with open hearth furnaces and since 1909 with electric furnaces. It ranks among the leading steel foundries in Italy.

M. Vanzetti was a director of many important concerns in Italy, including the Terni Steelworks and the Quarnaro shipyards. For 30 years he was a member of the advisory board of the Milan chamber of commerce; he acted in an advisory capacity to the Milan branch of the Bank of Italy, was vice president of the Italian association of metallurgical industries in Milan. He also was a vice president of the French foundry association and professor at the French high school of foundry. He was a member of many technical and engineering associations and a member of the American Chamber of Commerce in Milan and of the Rotary club. He was a member of the American Foundrymen's association and cooperated in organizing the Italian delegation to the Detroit Congress in 1929.

In 1931 Mr. Vanzetti was the moving spirit in a congress and exhibition participated in by European foundrymen and held at Milan. In recognition of this important work the King of Italy conferred upon him the decoration of Cavaliero Al Merito del Lavoro. He also won many other orders from the Italian crown and was a commander of the Order of the British Empire.

Joseph F. Perrault, 60, owner of the Fitchburg Foundry Co., Fitchburg, Mass., died recently.

Carl L. Dorer, president, C. L. Dorer Foundry Co., Bellaire, O., died recently.

Chester Wallbrecht, 40, superintendent of the D. T. Williams Valve Co., Cincinnati, died at Cincinnati recently.

J. S. Smith, secretary, Smith Facing & Supply Co., Cleveland, died suddenly on May 4 following an operation.

John Sheridan, 46, purchasing agent for the Granite City, Ill., plant of American Steel Foundries, Chicago, died at Granite City recently.

Louis Mertens, 77, founder of the Keystone Brass Works, Erie, Pa.; and its operator for many years, died April 22 at his home in Erie following an illness of one week.

Robert J. Rode, 59, affiliated with the pattern shop of the Jones & Laughlin Steel Corp., Pittsburgh, for the past 42 years, died at Pittsburgh, May 8.

John R. Russel, 74, former president, Great Lakes Engineering Works, Detroit, and at one time secretary and treasurer and vice president, Russel Wheel & Foundry Co., Detroit, died at Detroit recently.

John P. Braun, age 53, formerly with the Butler Street Foundry & Iron Co., Chicago, and for the last 10 years vice president and a director of Midland Structural Steel Co., Chicago, died recently.

Charles L. Lamarche, 75, president, American Malleable Castings Co., Marion, O., died at Marion recently. Mr. Lamarche organized the company in 1905 and his three sons now are officials in the company.

John J. Lebherz, 77, former president of the Niagara Frontier Brass Co., died recently in a Niagara Falls, N. Y., hospital following an operation. He was a former member of the board of aldermen in Niagara Falls, but had been retired from active business for several years.

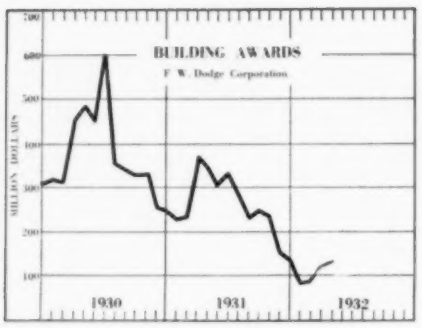
Joseph A. Kelly, 75, recently president of the Reliance Steel Casting Co., Pittsburgh, died in that city April 25. Mr. Kelly was the founder of the Reliance company, previously having been identified with the American Steel Foundries at Pittsburgh. He also was vice president of the Vulcan Crucible Steel Co., Aliquippa, Pa.

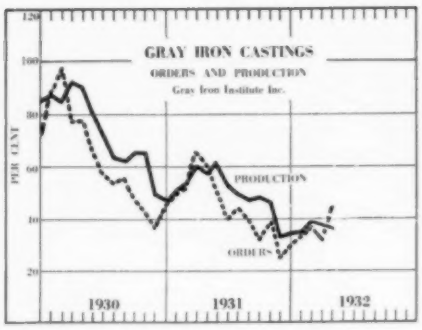
Maurice J. Monahan, 64, for the past 12 years special sales representative, International Molding Machine Co., Chicago, and a well known figure in the foundry world for the past 35 years, died in Chicago May 18. Mr. Monahan was born in Boston. He served his time as a molder in a small foundry in St. John, New

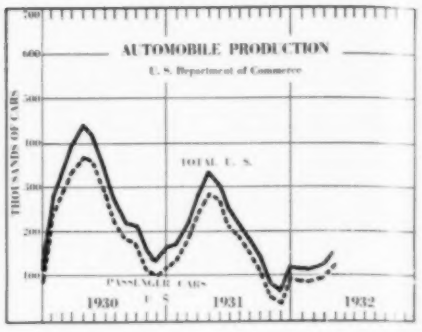
Maurice J. Monahan

Brunswick, and then was employed by the General Electric Co., Lynn, Mass. Later he left that company to become foundry foreman of what is now the Turner Tanning Machinery Co., Peabody, Mass. He then went to Syracuse Chilled Plow Co., Syracuse, N. Y., now a division of Deere & Co., where he was foundry superintendent for three years, leaving that position to accept the foundry superintendency at International Heater Co., Utica, N. Y. which position he occupied for 8 years. Mr. Monahan became superintendent at Hitchings & Co., Elizabeth, N. J., now Burnham Boiler Corp., remaining in that position for 3 years, and later he took charge of the foundry of Weil-McLain Co., in Canton, Ohio, and then in Michigan City, Ind. Due to his extensive experience in producing furnace and boiler castings, Mr. Monahan was regarded as an authority in this line of castings manufacture.

Erastus Foote, 81, formerly identified with the Dearborn Foundry Co., Chicago, died May 24 in St. Augustine, Fla. He entered the foundry industry at the age of 18 and in 1873 organized the Dearborn Foundry Co., in which he was active until he retired in 1914. Since that time he had made his home in Maine and in Florida.







Foundry Activities

Reflect Industrial Trends

GENERAL Foundries Co., 1555 South Barclay street, Milwaukee, formerly the Lakeside Foundries Corp., has added a brass foundry division to its gray iron foundry. Fred Busche, formerly general manager, Allen-Hough Carryola Co. and previous to that vice president and works manager, Prime Mfg. Co., is president of the general company and in charge of foundry operations. Michael Schnieder is vice president and Miss E. Francis is secretary and treasurer. The foundry is operating at about 80 per cent of normal.

* * *

Advance Pressure Castings, New York, has been incorporated by H. Coldman, 120 Broadway.

* * *

Art Aluminum Foundry, 3053 North Western avenue, Chicago, has leased a 1-story manufacturing building at 3266 Elston avenue.

* * *

Henry Lindahl Foundry & Machine Co., 5900 Ogden avenue, Chicago, has decreased its capital stock from $100,000 to $50,000.

* * *

Approximately 10,000 tons of cast steel will be required for tunnel work of the Pennsylvania railroad in Baltimore.

* * *

Bingham & Taylor Ltd., St. Catharines, Ont., has been incorporated to operate a foundry and machine shop.

* * *

Gohmann Foundry Co. Inc., New Albany, Ind., recently organized, has leased the foundry of the Charles Hegewald Corp., State and Water streets, and operations started May 16. Leon Gohmann is president, Miss Mary Gohmann vice president and Maurice Gohmann secretary, treasurer and general manager.

* * *

Morris Foundry Inc., 20 East Sibley street, Fond du Lac, Wis., recently suffered severe damage by fire. Rebuilding and replacement of equipment is under way.

* * *

About 1800 tons of material, consisting chiefly of gray iron castings, will be required for the $600,000 die contract recently awarded the Edward G. Budd Mfg. Co., Philadelphia, by the Citroen Motor Co. of France. It is reported castings will be secured from Philadelphia foundries.

* * *

Directors and officers of the General Steel Castings Corp., Eddystone, Pa., recently were re-elected. In addition, John H. Locke, formerly manager of operations, was elected vice president.

* * *

Standard Steel Works Co., Burnham, Pa., has completed the installation of a modern sand conditioning and distributing system and has installed a number of new molding machines.

* * *

Superior Bronze & Aluminum Co., Warren, O., will move its plant to Youngstown as soon as a suitable location is found, according to A. J. Gilmour, general manager. The plant has a capacity of ten tons daily.

* * *

Poole Foundry & Machine Co. has been organized to conduct the former business and plant of the Poole Engineering & Machine Co., with general and works at Woodberry, Baltimore. F. T. Brady is president, F. T. Brady Jr., vice president and L. M. Ricketts, secretary and treasurer.

* * *

Pressed Steel Car Co., McKees Rocks, Pa., has installed a 1½-ton per hour electric furnace made by the Pittsburgh Electric Furnace Corp., Pittsburgh. The Pressed Steel Car Co. at present has two cupolas and four open hearth furnaces and manufactures steel, gray iron and malleable castings. The smaller electric unit is intended to supply the need for reduced melting requirements.

RAW MATERIAL PRICES
June 6, 1932

Iron	
No. 2 foundry, Valley	$14.50 to 15.00
No. 2 Southern, Birmingham	11.00
No. 2 foundry, Chicago	15.50 to 16.00
No. 2 foundry, Buffalo	16.00
Basic, Valley	14.00 to 14.50
Basic, Buffalo	15.50 to 16.00
Malleable, Chicago	15.50 to 16.00
Malleable, Buffalo	16.50
Coke	
Connellsville Beehive Coke	$3.00 to 4.25
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$9.25 to 9.75
Heavy melting steel, Pitts.	8.75 to 9.25
Heavy melting steel, Chicago	6.00 to 6.25
Stove plate, Buffalo	7.00 to 7.25
Stove plate, Chicago	5.00 to 5.50
No. 1 cast, New York	5.00 to 5.50
No. 1 cast, Chicago	6.00 to 6.50
No. 1 cast, Philadelphia	9.00
No. 1 cast, Pittsburgh	9.00 to 9.50
No. 1 cast, Birmingham	8.00 to 9.00
Car wheels, iron, Pittsburgh	9.50 to 10.00
Car wheels, iron, Chicago	6.25 to 6.75
Railroad malleable, Chicago	6.25 to 6.75
Agricultural mal., Chicago	5.50 to 6.00
Malleable, Buffalo	8.00 to 8.50
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	5.12½
Straits tin	20.00 to 20.25
Aluminum, No. 12, producers	22.00
Aluminum, No. 12 remelt	7.00 to 8.00
Lead, New York	3.00
Antimony, New York	5.12½
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	2.82½

Shown above is the Spencer Turbo-Compressor in service at the Central Iron Foundry, Detroit. Capacity 10,000 cu. ft.—1 lb. pressure.

IN your search for ways to cut foundry costs, start with the air supply equipment.

Sooner or later your investigations will bring you face to face with the practical—not just theoretical—economy of slow speed, multistage operation—the Spencer Turbo. Slow speed operation brings you lower melting costs and lower operating costs.

... Lower melting costs, because the ample volume of air is so easily controlled, enabling the operator instantly to adjust volume and pressure to meet changing conditions.

... Lower operating costs, because the slow speed 1750 R. P. M. turbo does all the work that high speed blowers can do, but with less effort. Less wear and tear, less vibration, less noise.

The lower cost of slow speed turbo operation begins at the outset. No costly foundation needed, no fussy alignment.

Maintenance is exceptionally low. All clearances are wide. Two over-size Ball Bearings are the only contacts. Rust resisting and corrosion resisting steel construction.

Sizes from 125 to 20,000 cu. ft.—1 to 300 H. P.—8 oz. to 4 lbs.

Our Foundry Bulletin gives the How and Why of lower melting costs. Shall we send it?

THE SPENCER TURBINE CO.
HARTFORD CONNECTICUT

SPENCER
TURBO-COMPRESSORS

1778

New Trade Publications

ALLOYS—Federated Metals Corp., 295 Madison avenue, New York, has issued a folder listing the various alloys, nonfluxing alloys, hardeners, etc., manufactured by that company.

FIELD RHEOSTATS—Hand operated field rheostats are described and illustrated in a recent bulletin No. 1084A, published by the General Electric Co., Schenectady, N. Y.

VIBRATING SCREENS — Link-Belt Co., Chicago, has published folder No. 1262 describing its positive-drive type and its unbalanced-pulley type vibrating screens for heavy-duty service. Either of the screens is supplied with single or multiple screening decks.

GAS PUMPS—Features of a new design of gas pump for industrial use are described in a recent bulletin of the Roots-Connersville-Wilbraham division of the International-Stacey Corp., Connersville, Ind. Capacities at different pressures and listed speeds also are presented.

SIGNALING EQUIPMENT—Federal Electric Co., Chicago, has published a folder illustrating and describing its line of signaling equipment for industrial use. The text includes information on general alarm sirens, alarm controls, code control equipment, industrial signals and air whistles.

SANDERS—A variety of sanding machines especially adapted for use in the pattern shop are described and illustrated in a bulletin recently issued by the Porter-Cable Machine Co., Syracuse, N. Y. Information also is included on band saws, milling attachments and a core print gage.

CENTRIFUGALLY CAST BRONZE—Shenango-Penn Mold Co., Dover, O., has published bulletin No. 131 devoted to information on centrifugally cast bronze for propeller shaft sleeves, pump liners, bearings, roll covers, and bushings, manufactured by that company. Views of the castings department of the firm also are shown.

SUCTION BLAST NOZZLES—Direct Separator Co., Inc., Syracuse, N. Y., has published a bulletin illustrating and describing its line of suction blast nozzles for cleaning iron, steel and brass castings, etc. Divide air separators for removing water and oil in compressed air lines are described in the second section of the bulletin.

SUCTION LINE PRIMER—A priming device for centrifugal pumps is described and illustrated in a bulletin by the Barrett, Haentjens & Co., Hazelton, Pa. The mechanical features of the device which combines in one compact casting a check valve, strainer, and air removing device, are presented in detail.

STAINLESS STEEL—Lebanon Steel Foundry, Lebanon, Pa., has published two bulletins; one describing its Circle "L" alloy steels for high stresses and wear resistance, and its Circle "L" stainless alloy steels for corrosion-resistance. Physical properties of the materials are presented and halftones illustrate some of the uses of the metal.

GRINDING WHEELS—"Factors Affecting Grinding Wheel Selection" is the title of a booklet issued by the Norton Co., Worcester, Mass. Information includes composition and characteristics of grinding wheels, Norton method of marking grinding wheels, fundamental factors for determining grinding wheel specifications, and the selection of a grinding wheel.

TOBIN BRONZE—Properties and applications of tobin bronze are included in a recent catalog published by the American Brass Co., Waterbury, Conn. In addition to a general discussion of the physical properties, corrosion resisting properties and the various applications for tobin bronze, data are given on physical properties, crushing strength, torsional strength, fatigue and impact tests, etc.

SAND MIXERS—Besser Mfg. Co., Alpena, Mich., has published a folder describing and illustrating its line of foundry sand conditioners. The devices, designed to blend mixtures and aerate the sand in one operation, is illustrated in several sizes, ranging from 5000 to 1800 pounds per batch. A description of the line of core sand mixers manufactured by the company also is included in the publication.

AIR FILTERS — Northern Blower Co., West Sixty-fifth street and Barberton avenue, Cleveland, has published bulletin No. 500-1 describing its continuous operating air filters. The filters, which are self-cleaning during operations, are supplied in various sizes from 22½ to 46 inches in diameter and from 5 feet to 11 feet in height, not including the hopper. Sectional drawings indicate the design of the equipment and the method of operation.

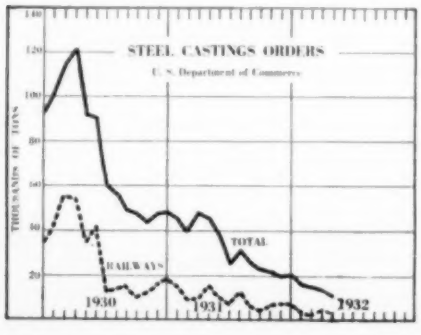
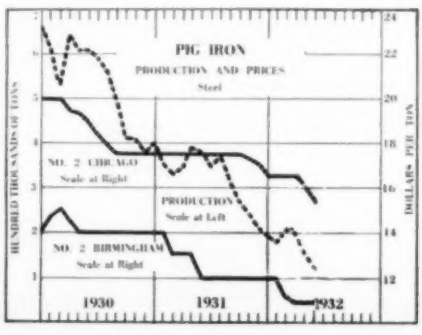
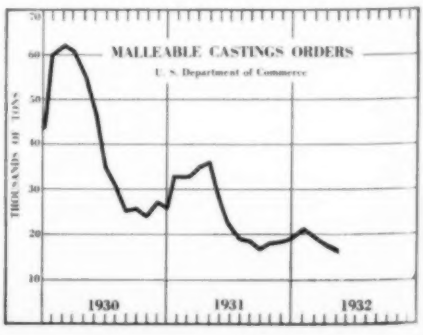
MAGNESIUM ALLOYS—Dow Chemical Co., Midland, Mich., has prepared a new catalog which includes information on magnesium, magnesium alloys and Dowmetal. The catalog is divided into four sections presented under the headings of properties, shop practice, available forms and miscellaneous. Under the heading of castings, information is given on the physical properties of the metal in the cast condition and also a list of the companies manufacturing magnesium castings in sand and permanent molds.

INDUSTRIAL CAR EQUIPMENT—Atlas Car & Mfg. Co., Cleveland, recently issued its bulletin No. 1240, illustrating and describing its line of industrial car equipment for a variety of uses. The equipment of interest to the foundry industry includes turntables, kiln cars, equipment for continuous tunnel kilns, electric storage battery trucks and tractors for industrial use, trucks and trailers of various types, oven cars, annealing cars with sand seal, sandblast cars, ladle cars, cupola charging scale cars with bucket conveyor, etc.

TRAMRAIL — Cleveland Electric Tramrail division of the Cleveland Crane & Engineering Co., Wickliffe, O., has published several folders illustrating various applications for tramrail systems in industry. One entitled "Some Things Are Hard To Believe" includes an illustration of the handling of scrap metal with a magnet. A second folder describes that type of handling equipment in the automobile industry and illustrates the pouring of cylinder molds with a cab controlled ladle carrier. A third folder dealing with the mechanical distribution of foundry sand illustrates both hand operated and motor operated distribution systems.

Applies Economy In Evanston

HERBERT S. SIMPSON, National Engineering Co., Chicago, and president of the Foundry Equipment Manufacturers association is an alderman in his home city, Evanston, Ill.

As chairman of the finance committee he has been successful in reducing a current tax levy ordinance by $139,560 following its adoption early in May. Compared with the original tax levy the grand total reduction embodied in the operating budget now amounts to $333,969.

This provides an example of effective measures which are possible in securing a business administration of public affairs, recommended in the address by S. Wells Utley, The Foundry for May.